

# Installation and Operating Manual

for Users and Heating System Installers

## **Heat Pump Controller** for Low, Medium and High-Temperature Heat Pumps for Heating and Cooling



# Table of Contents

<b>General .....</b>	<b>3</b>
<b>1 Operation of the Heat Pump Controller .....</b>	<b>4</b>
1.1 Heat Pump Controller WPM 2004 plus .....	5
1.2 Special accessories for the heat pump controller .....	5
<b>2 Scope of Delivery and Installation .....</b>	<b>5</b>
2.1 Scope of delivery of wall-mounted heat pump controllers .....	5
2.2 Installation .....	6
2.2.1 Mounting the wall-mounted heat pump controller .....	6
2.2.2 Temperature sensor (heating controller) .....	6
<b>3 User Operation .....</b>	<b>8</b>
3.1 General .....	8
3.1.1 Operation .....	8
3.1.2 Operating mode .....	9
3.1.3 General information about the menu .....	10
3.1.4 Settings menu .....	11
3.1.5 Operating Data Menu .....	14
3.1.6 History Menu .....	16
3.1.7 Heating curves (lowering and raising) .....	17
3.1.8 Hot water heating .....	17
3.2 Displays .....	18
3.2.1 Normal operating states .....	18
3.2.2 Fault messages .....	20
<b>4 Settings by Heating Experts .....</b>	<b>21</b>
4.1 Preconfiguration of the Heat Pump Heating System .....	21
4.1.1 Preconfiguration menu .....	21
4.1.2 Coding .....	22
4.2 Configuration of the heat pump heating system .....	22
4.2.1 Inputs .....	28
4.2.2 Outputs .....	29
4.2.3 Special functions .....	30
4.2.4 Modem / PC-connection .....	31
4.3 Energy-efficient operation .....	31
4.4 Setting the heating curve .....	32
4.4.1 Setting examples .....	33
4.4.2 Heating curve optimisation .....	34
4.4.3 Fixed-setpoint control / setting of a horizontal heating characteristic .....	34
4.5 Water heating .....	35
4.5.1 Maximum storage tank temperatures .....	35
4.5.2 Water heating terms .....	35
4.5.3 Setting of hot water generation without reheating .....	35
4.5.4 Setting of hot water generation with reheating .....	35
4.5.5 Automatic adaptation of the max. temperature in the heat pump mode .....	36
4.5.6 Activation of heat pump and immersion heater .....	36
4.5.7 Hot water rapid heating .....	37
<b>5 Functional Description .....</b>	<b>38</b>
5.1 Limit temperature (Balance Point) .....	38
5.2 Heating water hysteresis .....	38
5.3 Service interruption by energy providers .....	38
5.4 Performance control / activation of the heat generators .....	39
5.4.1 Bivalence settings .....	39
5.4.2 Call for supplementary heat source .....	40
5.4.3 Activation of supplementary heat source .....	40
5.5 Switching cycle lockout and time delays .....	41
5.6 Activation of circulating pumps .....	41
5.6.1 Heating circulating pump .....	41
5.6.2 Hot water circulating pump .....	42
5.6.3 Swimming pool circulating pump .....	42
5.6.4 Auxiliary circulating pump .....	42
5.6.5 Primary pump for heat source .....	42
5.7 Safety functions .....	42

5.7.1	Resetting of faults .....	42
5.7.2	Sensor Break .....	42
5.7.3	Frost protection .....	43
<b>6</b>	<b>Special Functions.....</b>	<b>43</b>
6.1	Commissioning (of air-to-water heat pumps) .....	43
6.2	Initial heating program (screed drying).....	43
6.2.1	Underfloor heating functional check according to DIN EN 1264-4 .....	43
6.2.2	Heating for screed drying and floor covering preparation .....	44
6.2.3	Implementation of the guideline for heat pump heating systems .....	45
<b>7</b>	<b>Extended Functional Description of Heat Pump Controller (Manager) for Heating / Cooling..</b>	<b>46</b>
7.1	Controller design .....	46
7.1.1	Network operation of heating and cooling controller and remote control station.....	46
7.1.2	Temp. sensor (cooling contr.) .....	46
7.2	Cooling.....	47
7.2.1	Activation of the cooling mode .....	47
7.2.2	Activation of the cooling functions.....	47
7.2.3	Silent and dynamic cooling .....	47
7.2.4	Heating circulating pump of heating circuit 1 .....	47
7.2.5	Heating circulating pump of heating circuit 2 .....	47
7.2.6	Safety functions (displayed on controller) .....	47
7.3	Functional description of Active cooling .....	48
7.4	Functional description of passive cooling station .....	48
7.5	Functional description of wall-mounted cooling controller.....	48
7.5.1	Cycling behaviour of primary pump.....	48
7.5.2	Circulating pump for cooling (cold distribution) .....	48
<b>8</b>	<b>Technical Equipment Information.....</b>	<b>49</b>
<b>9</b>	<b>Integration Examples .....</b>	<b>49</b>
9.1	Heat pump system for heating purposes.....	49
9.2	Heating/cooling heat pump system .....	50
<b>10</b>	<b>Circuit Diagrams.....</b>	<b>51</b>
10.1	Heat pump controller for heating .....	51
10.2	Key to the circuit diagram of the heat pump controller for heating .....	52
10.3	Heat pump controller for heating and cooling.....	53
10.4	Key to the circuit diagram of the heat pump controller for Heating/Cooling .....	55
<b>11</b>	<b>Displays.....</b>	<b>56</b>
<b>12</b>	<b>Special Accessories.....</b>	<b>58</b>
12.1	Remote control station .....	58
12.2	Remote Diagnosis System (RDS).....	58
12.3	Room climate control station .....	58
<b>13</b>	<b>Electrical Wiring, Heat Pump .....</b>	<b>59</b>
<b>14</b>	<b>Quick Reference Guide for the User.....</b>	<b>60</b>

## General

The instructions contained in this installation and operating manual are to be followed during the installation, operation and maintenance of the controller. The installation and repair of the equipment should be performed by qualified experts only. Improper repairs may result in considerable hazards for the user. According to applicable regulations, the installation and operating manual should be kept in a handy place for ready reference at all times and be handed to the qualified expert whenever work on the equipment needs to be carried out. May we therefore ask you to pass this manual on to the next tenant or owner when you move out. The unit must not be connected if there is any visible damage to the equipment. In this case it is imperative that the supplier be consulted. To avoid any consequential damage make sure that only genuine replacement parts are used. Make sure that the packing material is disposed of properly in accordance with applicable environmental requirements.

## Regulations and Safety Notices!

- Any adjustments inside the unit may be performed by qualified installation technicians only.
  - On commissioning, all applicable VDE safety requirements, in particular VDE 0100 and the technical connection requirements [German: Technische Anschlussbedingungen (TAB)] of the Utility Companies (UC) and the supply network operators have to be complied with!
  - The heat pump controller should only be operated in dry rooms with temperatures between 0 °C and 35 °C. The formation of condensation is not permissible.
  - All sensor connecting lines with a wire cross-section of 0.75 mm<sup>2</sup> may be extended to up to max. 30 m. Sensor lines must not be routed together with live wires.
  - To ensure the freeze protection function, the heat pump controller must not be disconnected from the power supply, and adequate water flow through the heat pump must be maintained.
  - The switching contacts of the output relays are interference-suppressed. Therefore, depending on the internal resistance of a measuring instrument, a voltage can be measured – also if the contacts are not closed – which, however, is significantly lower than the mains voltage.
- Extra-low voltage is applied between terminals J1 to J7 and J11 as well as at the connectors X2, X3 and X8. If – due to a wiring error – mains voltage is applied to these terminals, the heat pump controller will be destroyed.
  - In the event that a WPM 2002 plus (old) controller is replaced with a heat pump controller (new), the actuating direction of the high-pressure and low-pressure pressostats must be checked and adapted, if necessary (see Chapter 4.2)

## 1 Operation of the Heat Pump Controller

The heat pump controller is required for the operation of air-to-water, brine-to water and water-to-water heat pumps. It controls bivalent, mono-valent or monoenergetic (single energy) heating installations and monitors the safety devices of the refrigeration cycle. It is either integrated into the cabinet of the heat pump or it is supplied together with the heat pump as a wall-mounted controller which assumes both the control of the heat utilisation and the heat source systems.

### Heating cycle control

The outdoor temperature-driven control via the return flow temperature enables the heat pump heating system to be operated in an optimally energy-efficient manner. In the heating mode, two independent heating circuits are demand-controlled, i.e. the preset heating curve can be raised or lowered via time-control programs.

### Activation of ancillary equipment

of the heat source, heat generating and heat utilisation systems.

### Water heating

Priority control in case of a call for hot water and to control the supplementary heating device

### Supplementary heating source

The control takes over the demand-controlled activation and deactivation of a supplementary heating source, if any.

### Cooling cycle control

The cooling cycle is controlled in conjunction with the cooling controller of a reversible heat pump or a passive cooling plant.

## 1.1 Heat Pump Controller WPM 2004 plus

☛ Not all functions are available for every heat pump type and every equipment configuration.

- 6-key comfort operation
- Large, well laid-out illuminated LC display with display of present operating status and service messages
- Meets the requirements of utility companies (UC)
- Dynamic menu-based user guidance, adapted to the configured heat pump system
- Interface for remote control unit with identical menu options
- Outdoor temperature-controlled heating cycle
- Control of 2 heating circuits
- Priority control
  - Cooling takes priority over
  - water heating which has priority over
  - space heating and
  - swimming pool heating
- Actuation of a supplementary heat source (oil- or gas-fired boiler or electric resistance heating)
- Actuation of a mixer valve for a supplementary heat source (oil-, gas-, solid fuel-fired boiler or solar energy storage system)
- Special program for supplementary heating to ensure minimum operation (oil-fired boiler) or minimum heat-up times (central storage tank)
- Control of an immersion heater enabling specific reheating of domestic hot water by means of adjustable time programs
- Demand-driven control of 5 circulating pumps
- Defrost management to minimise defrost energy through flexible, self-adaptive defrost cycle times
- Compressor management for a uniform utilisation of the compressors in heat pumps equipped with two compressors
- Working hour meter for compressor, circulating pumps and supplementary heat source
- Keypad lock, child-proof lock
- Alarm memory with date and time
- Interface for communication via PC
- Automated program for specific screed drying with storage of the start and completion time

## 1.2 Special accessories for the heat pump controller

- Option to add a "Cooling" operating mode (see Chapter 1)
- Remote control unit can be connected
- Modem connection for online remote monitoring and display of heat pump parameters.

## 2 Scope of Delivery and Installation

The heat pump controller is either integrated into the cabinet of the heat pump or it is supplied together with the heat pump as a controller for wall-mounting.

### 2.1 Scope of delivery of wall-mounted heat pump controllers

The wall-mounted controller is supplied in two versions. The standard heat pump controller WPM 2004 plus is designed to control the heating cycle. The heating/cooling heat pump controller WPM 2004 R provides the additional cooling control function.

The following parts are included in the scope of delivery of the wall-mounted heat pump controller:

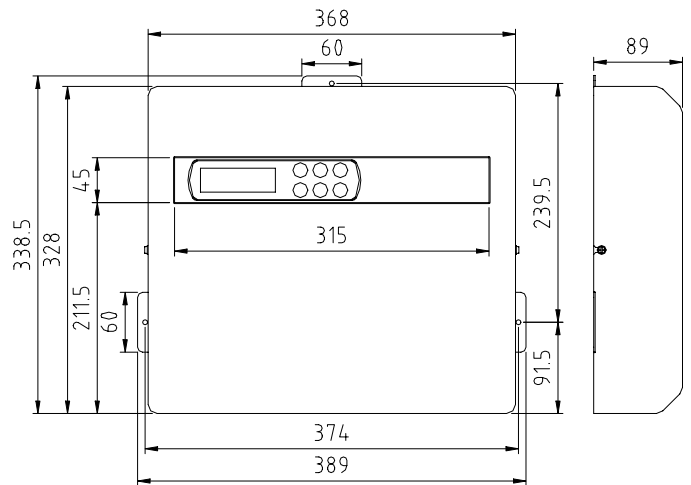
- heat pump controller
- 3 dowels (6 mm) with screws for wall-mounting
- Outside wall temperature sensor including attaching screw and dowel
- Installation and operating manual

## 2.2 Installation

### 2.2.1 Mounting the wall-mounted heat pump controller

The controller is secured to the wall using the supplied 3 screws and dowels (6 mm). To prevent the controller from being contaminated or damaged, proceed as follows:

- Install dowel for the upper eye hook at operating level.
- Turn screw into dowel to such an extent that controller can still be engaged.
- Engage controller in upper eye hook.
- Mark position for lateral eye hooks.
- Disengage controller.
- Install dowels for the lateral eye hooks.
- Re-engage controller at the top and secure with screw.



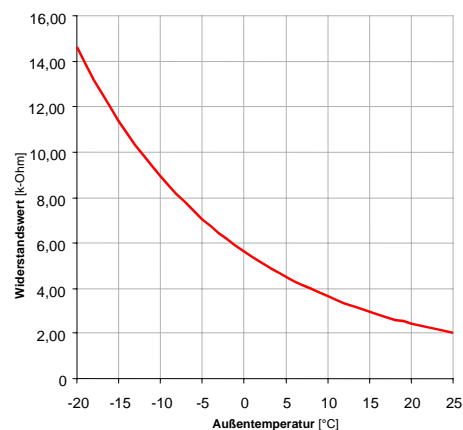
**Fig. 2.1** Dimensions of the wall-mounted heat pump controller WPM 2004 plus

### 2.2.2 Temperature sensor (heating controller)

All temperature sensors to be connected to the heat pump heating cycle controller correspond to the illustrated sensor diagram.

For the characteristic curve of the sensor connected to the cooling controller, refer to 7.1.2. Depending on the heat pump type, the following temperature sensors are already integrated or need to be mounted in addition:

- Outside wall temperature (see 2.2.2.1)
- Temperature sensors for heating circuits 1 and 2 (see 2.2.2.2)
- Flow temperature (frost protection) for air-to-water heat pumps only
- Heat source output temperature for brine- and water-to-water HPs only
- Hot water temperature



**Fig. 2.2:** NTC sensor acc. to DIN 44574

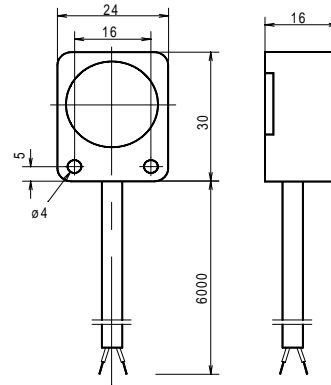
**Do not route sensor together with live wires !**

### 2.2.2.1 Installation of outside temperature sensor

The temperature sensor must be mounted in such a way that all climatic influences are captured and inaccurate readings prevented.

Mounting:

- to be attached with the sensor side (blue circle) to an external wall of a heated living space, preferably on the north or north-west side
- do not mount in a "protected" location (e.g. a wall niche or under a balcony)
- do not mount near windows, doors, air discharge openings, floodlights or heat pumps.
- do not expose to direct sunlight at any time of the year



**Fig. 2.3:** Dimensions of external wall sensor in insulation housing

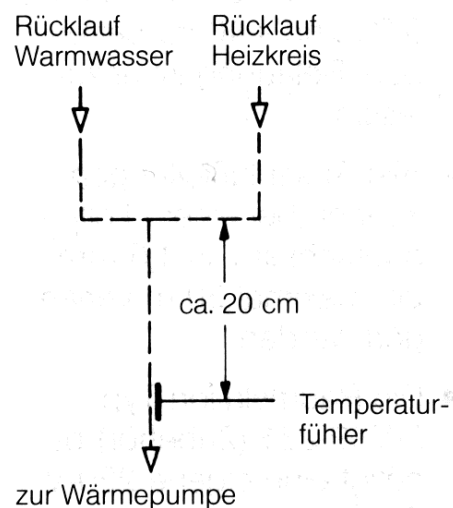
### 2.2.2.2 Installation of return flow temperature sensor

The return flow sensor needs only to be mounted if it is included in the delivery content of the heat pump but has not yet been installed. The return sensor can be mounted as clip-on pipe sensor or inserted into the immersion sleeve of the compact manifold.

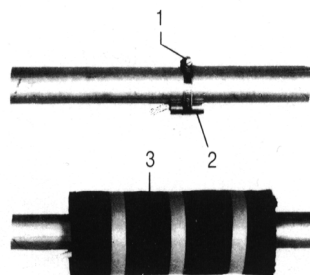
- The sensor must be mounted at the **common** return of hot water, heating circuit and swimming pool water
- Clean heating pipe of paint, corrosion and scale
- Apply (a thin coat) of heat conducting paste to the cleaned surface
- Secure sensor with hose clamp (tighten firmly as loose sensors will result in malfunctions) and provide thermal insulation

#### Compact manifold:

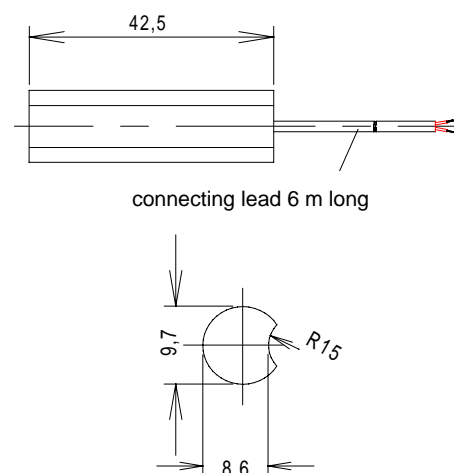
If a compact manifold is used in conjunction with the wall-mounted heat pump controller, the return flow sensor has to be inserted into the immersion sleeve. The hollow existing between sensor and immersion sleeve must be completely filled with heat conducting paste. For more detailed information refer to the mounting instructions of the compact manifold.



**Fig. 2.4:** Installation of return flow temperature sensor for heating circuit 1



- 1 Hose clamp
- 2 Sensor for return flow temperature
- 3 Thermal insulation



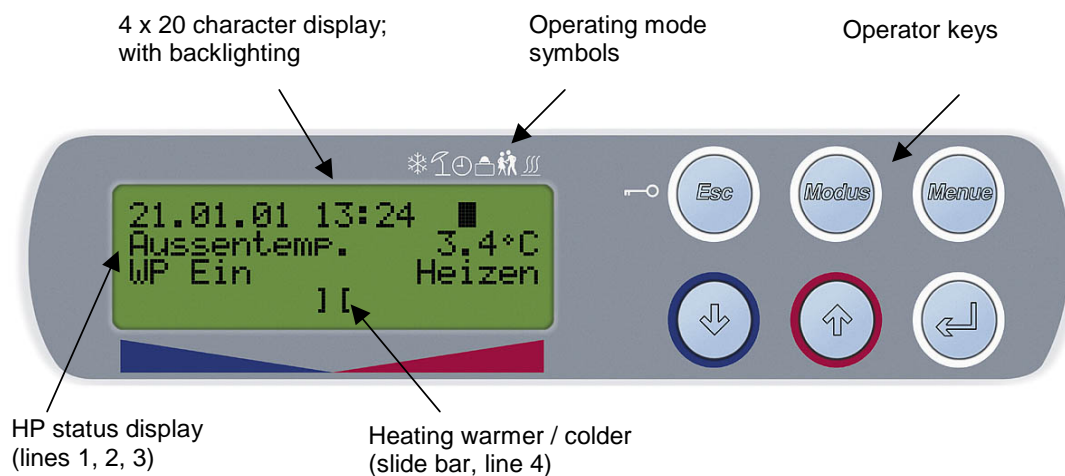
**Fig. 2.5:** Dimensions of return flow sensor in metal housing

## 3 User Operation

### 3.1 General

#### 3.1.1 Operation

- The heat pump controller is operated by means of 6 pushbuttons: Esc, Modus, Menue, ↓, ↑, ↵.
- The current operating status of the heat pump and the heating installation are indicated on the 4 x 20 character LC display in plain text (see 3.2).
- 6 different operating modes can be selected from:  
Cooling, Summer, Auto, Party, Holiday, Suppl. heat source.
- The menu has 3 main levels:  
Settings, Operating Data, History.



**Fig. 3.1:** LC display main screen with operator buttons

#### ☛ Contrast:

The LC display contrast can be adjusted. For this purpose, simultaneously press the keys (MENUE) and (↵) until the adjustment is completed.

The contrast can be increased by pressing the (↑) key, the contrast is decreased by pressing the (↓) key.

#### ☛ Keypad lock, child-proof lock!

To prevent accidental changes to the settings of the heat pump controller, press and hold the (Esc) key for approx. 5 seconds until the 'keypad lock active' display appears. Proceed in the same way to unlock the keypad.

The operation of the heat pump controller is effected by means of the 6 keys provided on the display panel.

Depending on the present display (main screen or menu), these keys are assigned the following functionality:

Key	Main screen	Menu
Esc	<ul style="list-style-type: none"> <li>Used to activate or deactivate the keypad lock</li> <li>To reset a malfunction</li> </ul>	<ul style="list-style-type: none"> <li>To exit the menu and return to the main screen</li> <li>To return from a submenu</li> <li>To exit a setpoint value without accepting changes</li> </ul>
Modus	<ul style="list-style-type: none"> <li>To select the operating mode (see 3.1.7)</li> </ul>	No action
Menue	<ul style="list-style-type: none"> <li>To jump to the menu screen</li> </ul>	No action
⇓	<ul style="list-style-type: none"> <li>To lower the heating curve (colder) (see 3.1.7)</li> </ul>	<ul style="list-style-type: none"> <li>To scroll downward between the menu items of a given level</li> <li>To decrease a preset value</li> </ul>
⇑	<ul style="list-style-type: none"> <li>To raise the heating curve (warmer) (see 3.1.7)</li> </ul>	<ul style="list-style-type: none"> <li>To scroll upward between the menu items of a given level</li> <li>To increase a preset value</li> </ul>
↩	No action	<ul style="list-style-type: none"> <li>To select a preset value within the relevant menu item</li> <li>To exit a setpoint value with accepting changes</li> <li>To jump to a submenu</li> </ul>

### 3.1.2 Operating mode




Six different operating modes can be selected by means of the (Modus) key; mode changeover takes place with a time delay. Any time a key is pressed, the operating mode can be changed in the sequence shown below.




#### Setting the operating mode

Select the desired mode of operation by repeatedly pressing the Modus key (text message). Once the setting has been completed, the changeover will take place after a waiting time of 10 seconds (the symbol in the display changes)

#### Note:

An optimised heating operation is only possible in the Automatic mode of operation.

<b>COOLING</b>  <i>Can only be selected if a cooling controller is connected (see Chapter 7)</i>		The heat pump operates in the cooling mode; separate control functions become active. This operating mode cannot be activated unless a cooling controller is connected to the heat pump controller and the Cooling function was enabled in the preconfiguration.
<b>SUMMER</b>		In the SUMMER operating mode, only domestic hot water and swimming pool water is heated by the heat pump. The space heating function is not activated. (Freeze protection is ensured).
<b>AUTOMATIC</b>		The heat pump operates in the automatic operating mode. Programmed temperature reduction and rise times as well as shut-off times for space heating and water heating are automatically activated. The water heating, space heating and pool heating functions are activated according to their respective priority ranking. The heat pump and the supplementary heating source are activated and deactivated, as required.

HOLIDAY (setback mode)		During the holiday operating mode, the heating curves are lowered and a water heating lock-out function is activated. Both functions are independent of the respective time control functions (see 3.1.7 and 3.1.7); however the preset setback values apply. The duration of the holiday mode can be set in the menu "1 Settings – Mode – Holiday mode". After this period has elapsed a switchover to the automatic mode takes place automatically.
PARTY (day mode)		During the Party operating mode, any programmed lowering of the heating curves (see 3.1.7) will be ignored. The duration of the Party operating mode can be set in the menu "1 Settings – Mode – Party mode". After this period has elapsed a switchover to the automatic mode takes place automatically.
Suppl. heat source (HS 2)		In this operating mode the heat pump is shut off, and the entire heating is provided by the supplementary heat source. The supplementary heat source may be an electric heating element, oil- or gas heating. Time programs as well as heat curve settings remain active.

#### **Operating mode 'supplementary heat source'**

In this operating mode, the heat pump is locked out, the heating operation in the case of single energy systems is carried out via electric resistance heating, in the case of bivalent systems via the supplementary heating source.

### 3.1.3 General information about the menu

#### **Dynamic menus**

The complete menu is described in the following. Due to the preconfiguration, the control functions and the menu layout are adapted to the existing installation upon commissioning. As a function of these settings, non-relevant menu items are thus dimmed.

E.g.: Water heating settings are not possible unless the menu item "DHW generation" has been configured with "yes" upon preconfiguration.

#### **Change of set-points:**

1. Keep the MENU key depressed for a few seconds (until the menu items are displayed)
2. Select the desired menu item (e.g. Settings) using the arrow keys
3. Confirm by pressing the ENTER key
4. Select the desired submenu item using the arrow keys
5. Actuate the ENTER key until the cursor jumps to the set-point value
6. Adjust the setting to the desired value using the arrow keys
7. Confirm changed value by actuating the ENTER key or discard the change by pressing the ESC key (in the case of menu items comprising multiple settings, the cursor will jump to the next setting, in all other cases it will jump to the upper left corner).

### 3.1.4 Settings menu

All settings for the user are carried out in the "Settings" menu option.

For explanations concerning the heating circuit and hot water functions refer to 3.1.7 and 3.1.7.

Apart from the menu structure and the explanations contained in the last column, the various setting ranges are displayed in the table below; values in bold type represent the factory configuration.

**To access the Settings menu, proceed as follows:**

- press the (MENUE) key for approx. 5 seconds
- confirm the Settings menu option by pressing the ENTER key.

Settings	Setting of all system-specific parameters	Setting range
Time	Menu for setting the time of the day. No automatic changeover from daylight saving to winter time.	
Mode	Different settings concerning the operating modes.	
Operating mode	Selection of the operating mode (corresponds to the Modus key)	Cooling Summer <b>Auto</b> Party Holiday Suppl. heat source.
Party mode No. of hours	Duration of party mode in hours	0 ... <b>4</b> ... 72
Holiday mode No. of days	Duration of holiday mode in days	0 ... <b>15</b> ... 150
Heating circuit 1	Settings for heating circuit 1	
HC 1 Time program Setback	All settings for lowering the heating curve of heating circuit 1	
HC 1 Setback Start	To set the time at which the temperature setback of heating circuit 1 is to be started.	<b>00:00</b> ... 23:59
HC 1 Setback End	To set the time at which the temperature setback of heating circuit 1 is to be terminated.	<b>00:00</b> ... 23:59
HC 1 Setback Setback value	To set the temperature value by which the heating curve of heating circuit 1 is to be lowered during a setback period.	<b>OK</b> ... 19K
HC 1 Setback MO ... SU	It is possible to select individually for each day of the week whether a setback is to become active. Setback periods over multiple days are always activated or deactivated upon day changeover.	<b>N</b> Y
HC 1 Time program Temp. rise	All settings for raising the heating curve of heating circuit 1	
HC 1 Temp. rise Start	To set the time at which the temperature rise of heating circuit 1 is to be started.	<b>00:00</b> ... 23:59
HC 1 Temp. rise End	To set the time at which the temperature rise of heating circuit 1 is to be terminated.	<b>00:00</b> ... 23:59
HC 1 Temp. rise Rise value	To set the temperature value by which the heating curve of heating circuit 1 is to be raised while the temperature rise mode is active.	<b>OK</b> ... 19K
HC 1 Temp. rise MO ... SU	It is possible to select individually for each day of the week whether a temperature rise is to become active. Temperature rise periods over multiple days are always activated or deactivated upon day changeover.	<b>N</b> Y

Settings	Setting of all system-specific parameters	Setting range
Heating circuit 2	Settings for heating circuit 2	
HC 2 warmer/colder	This setting serves to adjust the temperature to individual comfort levels (for heating circuit 2) (in accordance with the setting indicated on the main screen) If a higher temperature level is to be attained, the slide bar needs to be moved to the right using the Up key. If a lower temperature level is to be attained, the slide bar needs to be moved to the left using the Down key.	bar
HC 2 Time Program Setback	All settings for lowering the heating curve of heating circuit 2.	
HC 2 Setback Start	To set the time at which the temperature setback of heating circuit 2 is to be started.	00:00 ... 23:59
HC 2 Setback End	To set the time at which the temperature setback of heating circuit 2 is to be terminated.	00:00 ... 23:59
HC 2 Setback Setback value	To set the temperature value by which the heating curve of heating circuit 2 is to be lowered during a setback period.	0K ... 19K
HC 2 Setback MO ... SU	It is possible to select individually for each day of the week whether a setback is to become active. Setback periods over multiple days are always activated or deactivated upon day change-over.	N Y
HC 2 Time Program Temp. rise	All settings for raising the heating curve of heating circuit 2	
HC 2 Temp. rise Start	To set the time at which the temperature rise of heating circuit 2 is to be started.	00:00 ... 23:59
HC 2 Temp. rise End	To set the time at which the temperature rise of heating circuit 2 is to be terminated.	00:00 ... 23:59
HC 2 Temp. rise Rise value	To set the temperature value by which the heating curve of heating circuit 2 is to be raised while the temperature rise mode is active.	0K ... 19K
HC 2 Temp. rise MO ... SU	It is possible to select individually for each day of the week whether a temperature rise is to become active. Temperature rise periods over multiple days are always activated or deactivated upon day changeover.	N Y
Heating circuit 3	Settings for heating circuit 3	
HC 3 colder / warmer	This setting serves to adjust the temperature to individual comfort levels (for heating circuit 3) (in accordance with the setting indicated on the main screen) If a higher temperature level is to be attained, the slide bar needs to be moved to the right using the Up key. If a lower temperature level is to be attained, the slide bar needs to be moved to the left using the Down key.	bar
HC 3 Time Program Setback	All settings for lowering the heating curve of heating circuit 3.	
HC 3 Setback Start	To set the time at which the temperature setback of heating circuit 3 is to be started.	00:00 ... 23:59
HC 3 Setback End	To set the time at which the temperature setback of heating circuit 3 is to be terminated.	00:00 ... 23:59
HC 3 Setback Setback value	To set the temperature value by which the heating curve of heating circuit 3 is to be lowered during a setback period.	0K ... 19K
HC 3 Setback MO ... SU	It is possible to select individually for each day of the week whether a setback is to become active. Setback periods over multiple days are always activated or deactivated upon day change-over.	N J

Settings	Setting of all system-specific parameters	Setting range
HC 3 Time program Temp. rise	All settings for raising the heating curve of heating circuit 3	
HC 3 Temp. rise Start	To set the time at which the temperature rise of heating circuit 3 is to be started.	00:00 ... 23:59
HC 3 Temp. rise End	To set the time at which the temperature rise of heating circuit 3 is to be terminated.	00:00 ... 23:59
HC 3 Temp. rise Rise value	To set the temperature value by which the heating curve of heating circuit 3 is to be raised while the temperature rise mode is active.	0K ... 19K
HC 3 Temp. rise MO ... SU	It is possible to select individually for each day of the week whether a temperature rise is to become active. Temperature rise periods over multiple days are always activated or deactivated upon day changeover.	N J
Cooling	Settings for the cooling mode	
Dynamic cooling Setpoint (return)	To set the setpoint for the dynamic cooling mode. This temperature corresponds to a fixed return setpoint temperature.	10°C ... 15°C ... 30°C
Silent cooling Setpoint (room temp.)	To set the setpoint for the silent cooling mode. This temperature corresponds to the desired temperature in the room in which room climate control station 1 is located.	15.0°C ... 20°C ... 30.0°C
Hot water	Setting for water heating	
Hot water HW temp. HP mode	To set the hot water temperature that is to be achieved without any reheating function activated.	30°C ... 45°C ... HP max.
Hot water lockout	Water heating can be disabled by means of a time program.	
Hot water lockout Start	To set the time at which the water heating lockout function is to be started.	00:00 ... 23:59
Hot water lockout End	To set the time at which the water heating lockout function is to be terminated.	00:00 ... 23:59
Hot water lockout MO ... SU	It is possible to select individually for each day of the week whether a water heating lockout function is to become active. Lockout periods over multiple days are always activated or deactivated upon day changeover.	N Y
Hot water Reheating time pr.	Reheating must be enabled through a time program.	
DHW reheating Start	To set the time at which the booster heating function is to be enabled.	00:00 ... 23:59
DHW reheating End	To set the time at which the booster heating function is to be terminated.	00:00 ... 23:59
DHW reheating MO ... SU	It is possible to select individually for each day of the week whether a reheating function is to become active. Reheating periods to be enabled over multiple days are always activated and deactivated upon day changeover.	HP max. ... 50°C ... immersion heater max.
Hot water Quick heating	Setting that specifies whether a hot water rapid heating function is to be activated. For this purpose, HP and immersion heater are activated once until the setpoint is reached. This function resets itself automatically.	No Y
Date Year Day Month Week day	To set the date, year, day, month and day of the week. No automatic changing of the setting in leap years will occur.	
Language	The text of the menu can be selected in six languages: German, French, Italian, English, Dutch and Czech.	DEUTSCH ENGLISH FRANCAIS ITALIANO NEDERLAND CESKY

### 3.1.5 Operating Data Menu

All present operating data are displayed in the "Operating data" menu option.

The Operating Data menu can be reached as follows:

- Press the (MENUM) key for approx. 5 seconds
- Select the Operating Data menu option using the arrow keys and confirm by pressing the ENTER key.

Depending on the particular system configuration, the following data can be interrogated in the "Operating data" menu:

Operating data	Display of all current operating data
External temperatur.	Display of the current outdoor temperature, as measured by the external wall sensor (on the north or north-west side of the building). This value is used for the calculation of the return setpoint temperature taking into account the preset heating curve.
Return setp. temp. Heating circuit 1	Display of the currently valid return setpoint temperature for heating circuit 1.
Return temperature Heating circuit 1	Display of the current return temperature of heating circuit 1, measured at the common return pipe. This temperature is the controlled variable of heating circuit 1.
Flow temp. Heat pump	Display of the current flow temperature of the heat pump, measured at the common supply pipe. This temperature is used to ensure that the frost protection limits are complied with.
Defrost end sensor	Sensor for determining the defrost end in the case of hot gas defrosting.
Setpoint temp. Heating circuit 2	Display of the currently valid setpoint temperature for heating circuit 2, calculated from the preset heating curve for heating circuit 2.
Minimum temperature Heating circuit 2	Display of the currently valid minimum temperature for heating circuit 2 (calculated dew point plus dew point difference).
Temperature Heating circuit 2	Display of the current temperature of heating circuit 2. This temperature is, among others, the controlled variable for heating circuit 2.
Setpoint temp. Heating circuit 3	Display of the currently valid setpoint temperature for heating circuit 3, calculated from the preset heating curve for heating circuit 3.
Temperature Heating circuit 3	Display of the current temperature of heating circuit 3. This temperature is the controlled variable for heating circuit 3.
Heating Demand	Indicates whether a call for heating exists. It may happen that the heat pump is not operating although a call for heating exists (e.g. due to utility company interruption periods).
Bivalence point	Indicates which heating sources are allowed to be used for satisfying the heating demand. Three bivalence settings are possible.
Return temperature Passive cooling	Display of the current return temperature of heating circuit 1 during a cooling operation, measured at the return side of the passive cooling unit.
Supply temperature Passive cooling	Display of the current supply temperature of heating circuit 1 during a cooling operation, measured at the supply side of the passive cooling unit.
Frost protection, cold generator Cooling	Display of the current temperature captured by the frost protection sensor during cold generation. This temperature is used to ensure the operating limits in the cooling mode.
Temperature room 1 Setp. value	Display of the current room setpoint temperature.
Temperature room 1	Display of the current temperature in the room in which room climate control station 1 is located. This temperature is used as the controlled variable for silent cooling; it is also used for dew point calculation.
Humidity room 1	Display of the current humidity value in the room in which room climate control station 1 is located. This value is used for dew point calculation in the silent cooling mode.
Temperature room 2	Display of the current temperature in the room in which room climate control station 2 is located. This value is used for dew point calculation in the silent cooling mode.
Humidity room 2	Display of the current humidity value in the room in which room climate control station 2 is located. This value is used for dew point calculation in the silent cooling mode.
Cooling Demand	Indicates whether a call for cooling exists.
Hot water Setp. temperatur	Display of the current hot water setpoint temperature.

Hot water temp.	Display of the current hot water temperature, as measured in the hot water storage tank. This temperature is the controlled variable for hot water production.
Hot water Demand	Indicates whether a call for hot water exists. It may happen that the heat pump is not operating although a call for hot water exists (e.g. due to utility company interruption periods).
Swimming Pool Demand	Indicates whether a call for pool heating exists. It may happen that the heat pump is not operating although a call for swimming pool heating exists (e.g. due to utility company off-times).
Frost protection sensor	Display of the current temperature at the heat source outlet. This temperature is used to ensure that the lower operating limit is complied with.
Coding	Display of the current HP type. The following codes are possible: Air HP Brine-to-water HP Brine HP Water HP Air HP high-temperature Air HP reversible Brine HP reversible Air HP hot gas
Software Heating	Display of the software version currently used by the heating controller, including Boot and Bios versions as well as the valid network address.
Software Cooling	Display of the software version currently used by the cooling controller, including Boot and Bios versions as well as the valid network address.
Network heat/cool	Indicates whether a cooling controller is available on the network (Controller, cooling) and whether the network is operating correctly (Network o.k.).

#### ☛ Call for heating

A heating demand exists any time the "return setpoint temperature" minus the "hysteresis return temperature" lies above the currently measured "return temperature".

### 3.1.6 History Menu

In the "History" menu, the runtimes of compressor(s), circulating pumps and other components of the heat pump heating installation can be interrogated.

**To access the History menu, proceed as follows:**

- press the (MENUE) key for approx. 5 seconds
- select the History menu option using the arrow keys and confirm your selection by pressing the ENTER key.

The following values are available depending on the individual system configuration:

History	Display of runtimes and stored data
Compressor 1 Runtime	Total runtime of compressor 1.
Compressor 2 Runtime	Total runtime of compressor 2.
Suppl. heat source Runtime	Total runtime of the supplementary heat source.
Primary PUMP Runtime	Total runtime of the brine circulating pump in the case of brine-to-water heat pumps or of the well delivery pump in the case of water-to-water heat pumps. Due to pump priming and pump run-down times, this value is greater than the total compressor runtimes.
Fan Runtime	Total runtime of the fan of air-to-water heat pumps. Due to defrost operations (the fan is switched off during the defrost process), this runtime value is lower than the total compressor runtimes. This value is only displayed for air-to-water heat pumps.
Heating PUMP Runtime	Total runtime of the heating water circulating pump since the start-up of the controller. The runtime is greater than the sum of the compressor runtimes.
Cooling Runtime	Operating time during which active cooling was performed.
Hot water PUMP Runtime	Total runtime of the hot water circulating pump – since the start-up of the controller – during which domestic water heating was performed.
Immersion heater Runtime	Total on-time of the immersion heater since start-up of the controller during which domestic water heating was performed.
Swimming pool PUMP Runtime	Total runtime of the swimming pool circulating pump since start-up of the controller and during which time pool heating was performed.
Alarm memory No.2	Display of the most recent malfunction together with date, hour and cause.
Alarm memory No.1	Display of the last but one malfunction together with date, hour and cause.
UFH funct. check Start End	Display of start and end times of the most recently executed program of a functional check of the underfloor heating system.
Heat./screed drying Start End	Display of the start and end times of the most recently executed heating program for screed drying.

### 3.1.7 Heating curves (lowering and raising)

On commissioning, the heating curve is adapted in accordance with local conditions and the building structure. These heating characteristics can be adjusted to individual temperature requirements by means of the warmer/colder control on the main screen.

Use the ↑ key to raise the temperature: the slide bar displayed in the bottom line advances to the right.

Use the ↓ key to lower the temperature: the slide bar displayed in the bottom line advances to the left.

The setting for heating circuit 2 can be performed in the "Heating circuit 2" menu.

The preset heating curves may be lowered or raised in a time-controlled manner.

In buildings with poor insulation it is possible, for example, to lower the heating curve in order to save energy, or to raise it prior to off-times to avoid any extreme cooling of the building.

Where an overlap of raising and lowering activities occurs, the raising action takes precedence.

#### Energy-efficient operation

For an energy-efficient operation of the heat pump heating installation, the temperature level to be provided by the heat pump should be as low as possible.

In well insulated buildings, uniform heating operation without setback times normally result in lower energy costs since performance peaks requiring high flow temperatures can be avoided and the same comfort level can be achieved at lower temperatures.

### 3.1.8 Hot water heating

In the "Settings – Hot water" menu option, it is possible to program – apart from the hot water temperature – also off-times for water heating. During this time, no water heating is performed. With tanks of sufficient capacity it is recommended to set water heating or reheating to

occur at night in order to be able to benefit from often less expensive low-tariff times.

In addition, there is a possibility of time-controlled re-heating of hot water.

#### Activating the reheating function

Reheating can only be set if this function was configured accordingly. The water heating configuration is described in Chapter 4.5.

Electric reheating always takes place after the water was heated by the heat pump. The cold water flowing into the lower section of the tank is pre-heated by the heat pump.

Reheating of the hot water tank will not occur until the temperature falls below the level that can be attained in the heat pump mode.

#### Setting recommendation for the daily reheating operation:

Hot water lockout:	8 p.m. - 4.00 a.m.
Re-heating	4.00 a.m. - 6.00 a.m. (end of low tariff period)

Reheating appliance	Reheating appliance settings
None	Start 0.00 End 0.00
As a rule, after each water heating activity	Start 0.00 End 23.59 Enter the desired reheating temperature for each day of the week.

## 3.2 Displays

The current operating state of the heat pump system can be directly read off the LC display.

### 3.2.1 Normal operating states

Normal operating states and those governed by requirements of the utility company (UC) or safety functions of the heat pump are displayed. Only messages concerning the applicable system configuration and heat pump type will be displayed.

HP off	The heat pump is not operating because no call for heat exists.
HP on heating	The heat pump is operating in the heating mode.
HP on cooling	The heat pump is operating with the cooling mode active.
HP on hot water	The heat pump is operating in the water heating mode and is heating the hot water tank.
HP on swim. pool	The heat pump is operating and heating the swimming pool.
HP + HS 2 htg	The heat pump and suppl. heat source are operating in the heating mode.
HP + HS 2 swim. pool	The heat pump and suppl. heat source are operating and heating the swimming pool water.
HP + HS 2 hot water	The heat pump and suppl. heat source are operating in the water heating mode and are heating the hot water tank.
Minimum restart delay HP waiting	The heat pump starts - after a minimum restart delay has elapsed - in order to satisfy a heating demand. The minimum restart delay protects the heat pump and may last up to 3 minutes.
Switch. cycle lockout HP waiting	The heat pump starts after the restart time delay has elapsed in order to satisfy a heating demand. The time delay is a requirement of the utility company and may last up to 20 minutes. A maximum of 3 activations per hour are permissible.
Line load HP waiting	The heat pump starts after the power-up delay has elapsed in order to satisfy a heating demand. The power-up delay is a requirement by the utility company to take place after voltage recovery or after a utility company shut-off period, and may last up to 200 seconds.
Util. comp. shut-off HP waiting	The heat pump starts after the utility company shut-off time has elapsed. The utility company shut-off is predetermined by the utility company and lasts up to two hours, depending on the utility company. Activation and deactivation is effected by the utility company.
Ext. disable contact HP waiting	The heat pump is switched off by an external disable signal at the ID4.
Prim. pump flow temp. HP waiting	The heat pump starts after the primary pump priming process has been completed, which may last up to 3 minutes (safety function).
Low pressure limit HP waiting	The heat pump was switched off on reaching the low pressure limit. The heat pump restarts automatically. The suppl. heat source (HS 2) takes over the heat supply until the heat pump restarts automatically.
Low pressure cutout HP waiting	The heat pump was switched off when the low pressure limit was reached. The heat pump restarts automatically. The suppl. heat source (HS 2) takes over the heat supply until the heat pump restarts automatically.
Lower operating lim. HP waiting	The heat pump was switched off on reaching the low operating limit. The heat pump restarts automatically as soon as the heat source temperature has risen to a sufficiently high temperature (safety function).
High pressure prot. HP off	The heat pump is switched off on reaching the high pressure limit. The heat pump restarts automatically after a few minutes (high pressure safety program).

Temperature limit HP waiting	The heat pump cannot restart due to the temperature operating limit being reached. The outside temperature is below -15 °C or -20 °C or above 35 °C (safety function). Or else, the heat pump was disabled in the "Bivalent-alternat." mode because the outside temperature is lower than the limit temperature.
HP disabled Suppl. heat source	The heat pump is switched off because the suppl. heat source (HS 2) operating mode was selected. Heating is now provided by the suppl. heat source.
Flowrate monitoring HP on	Before defrosting of the evaporator is started, the flow rate of the heating water is monitored. This applies to air-to-water heat pumps only. The procedure lasts maximally 4 minutes.
Defrost HP on	The evaporator is defrosted by the heat pump. The procedure lasts maximally 8 minutes.
Upper operat. limit HP waiting	The maximum return flow temperature of 50°C was exceeded. When the temperature has dropped, the HP will restart automatically.
Delay Oper. mode cooling	On switchover to the Cooling operating mode and back, a time delay of 1 minute is activated. The heat pump remains deactivated during this time span.
Frost prot. refrigerat. Cold generator waiting	The cold generator cannot produce cooling despite an existing demand because the frost protection was activated. This state will be terminated automatically.
Supply temp. limit Cold generator waiting	The cold generator cannot produce cooling despite an existing demand because the current supply temperature lies below the operating limit. This state will be terminated automatically.
Dew Point monitor Cold generator waiting	The cold generator cannot produce any cooling despite an existing demand because the dew point monitor was activated (external input). This state will be terminated automatically.
Dew Point Cold generator waiting	The cold generator cannot produce any cooling despite an existing demand because the dew point that was calculated from the sensor values of the room climate control station was fallen short of. This state will be terminated automatically.
Cooling passive HP off	Cooling is performed in a passive manner; there is no call for heat pump operation.

### 3.2.2 Fault messages

Fault messages on the display are always classified into three categories:

- **Heat pump fault,**
- **sensor fault, and**
- **system fault.**

Please contact the customer service only when a heat pump malfunction (HP fault) has occurred. The following messages may appear on the display.

HP fault	<p>A heat pump fault indicates a defect in the heat pump. <b>The heat pump customer service is to be informed.</b> For a quick and precise fault diagnosis it is necessary that you state the type of malfunction, the heat pump designation and the software version of the controller. The heat pump malfunctions listed below may appear on the display, depending on the particular type of installation:</p> <ul style="list-style-type: none"><li>• Low pressure</li><li>• Freeze protection</li><li>• Motor prot.compr.</li><li>• Hot gas thermostat</li><li>• Temp. difference</li></ul>
System fault	<p>A system malfunction indicates a defect or a maladjustment in the heat pump system. <b>The local installer is to be informed.</b> For a quick and precise fault diagnosis it is necessary that you state the type of malfunction, the heat pump designation and the software version of the controller. The system malfunctions listed below may appear on the display, depending on the particular type of installation:</p> <ul style="list-style-type: none"><li>• Motor prot. Primary</li><li>• Flowrate well</li><li>• High pressure</li></ul>
Short-circ. or break	<p>In analogy to a plant malfunction, a broken sensor or a sensor short-circuit may have occurred. <b>The local installer is to be informed.</b> For a quick and precise fault diagnosis it is necessary that you state the type of malfunction, the heat pump designation and the software version of the controller. The sensors listed below may be defective, depending on the particular type of installation:</p> <ul style="list-style-type: none"><li>• Return sensor</li><li>• Hot water sensor</li><li>• 2nd heat circ.sensor</li><li>• Freeze prot. Sensor</li><li>• Antifreeze probe</li><li>• External sensor</li></ul>

#### System malfunction

In single-energy systems, the minimum return setpoint temperature is set (frost protection is ensured) in the case of any heat pump or system malfunction (frost protection is ensured). The electric heating element can be enabled via the 'supplementary heat source' operating mode.

## 4 Settings by Heating Experts

### 4.1 Preconfiguration of the Heat Pump Heating System

The preconfiguration is designed to tell the controller which components are connected to the heat pump heating system. The preconfiguration must be carried out prior to the configuration in order to make visible system-specific menu items or to hide certain items (dynamic menus).

#### 4.1.1 Preconfiguration menu

To access the Preconfiguration menu, proceed as follows:

- simultaneously press (for approx. 5 seconds) the key combination (ESC) and (MENUE).

To leave the Preconfiguration menu press the (ESC) key.

The following presettings must be performed:

Preconfiguration	Preconfiguration of all system components for a dynamic menu design	Setting range	Display
Operating mode	In which operating mode is the system operated? This means whether a and what type of suppl. heat source is available in the system. Single energy (using electric resistance heating), Monovalent (only HP), Bivalent-alternative (HP or suppl. heat source), Bivalent-parallel (HP and suppl. heat source)	Monovalent <b>Single energy</b> Biv.-parallel Biv.-alternat.	Always
Add. heat exchanger	Is an additional heat exchanger installed in the heat pump and is it used ?	<b>Yes</b> No	WP reversible
Heating circuit 1	Does the system have at least one heating circuit?	<b>Yes</b> No	Always
Heating circuit 2	Does the system have a 2 <sup>nd</sup> heating circuit? It is set to a lower temperature (e.g. surface heating) by means of a mixer valve.	<b>No</b> Yes	Always
Heating circuit 3	Does the system have a 3 <sup>rd</sup> heating circuit? It is set to a lower temperature (e.g. for surface heating) by means of a mixing valve.	<b>No</b> Yes	Heating circuit 2 HP not reversible System not bival.
Cooling function active	Is the cooling function of the reversible heat pump being used?	<b>Yes</b> No	WP reversible
Cooling function passive	Does the system have a passive cooling station?	<b>No</b> Yes	Brine/W or W/W HP
Cooling function passive System design	Is a two or four-pipe system used for passive cooling?	<b>2-pipe sys.</b> 4-pipe sys.	Brine/W o. W/W HP passive cooling funct.
DHW generation	Is the heat pump used for domestic water heating?	<b>No</b> Yes	Always
DHW generation Demand from	Is a sensor or a thermostat used for controlling the water heating process?	<b>Sensor</b> Thermostat	Hot water
DHW generation Immersion heater	Is an immersion heater for water (re-)heating installed in the system?	<b>No</b> Yes	Hot water
Swim. pool heating	Is the heat pump used for swimming pool water heating?	<b>No</b> Yes	Always
Brine low Pressure Measurement avail.	Is a pressostat for monitoring the brine pressure installed? If the setting is No the input will not be evaluated.	<b>No</b> Yes	Brine/W or W/W HP
Brine low Pressure	Is any tripping of the brine pressostat to be indicated on the display only, or are the heat pump and primary pump to be switched off?	<b>Display</b> Switch-off	Brine/W o. W/W HP Brine low pressure

### 4.1.2 Coding

Following any restoration of the power supply, the controller automatically detects which heat pump type is connected. To this end, each heat pump is equipped with a specific resistor for coding purposes in accordance with the table on the right:

**Caution:** An air-type heat pump cannot be correctly recognised unless no sensor is connected to input B7. (Freeze protection sensor for brine/W or W/W HP)

HP Type	Coding resistance
Air HP	$\infty$
Brine or water HP (display for HP with wall-mounted controller)	0 $\Omega$
Brine HP (display for HP with integrated controller)	8.2 k $\Omega$
Water HP (display for HP with integrated controller)	10.0 k $\Omega$
Air HP, high-temperature	13.0 k $\Omega$
Air HP reversible	5.6 k $\Omega$
Brine HP reversible	3.8 k $\Omega$
Brine HP hot gas defrost	2.8 k $\Omega$

#### Check the coding before proceeding with the setting:

Before attempting to set the heat pump controller, the coding of the heat pump type must be checked in the menu "2 OPERATING DATA". The coding is defined upon voltage recovery. In the case of a faulty coding, the heat pump controller must be briefly disconnected from the power supply.

The factory configuration in the "Preconfiguration" menu corresponds to the connection scheme of a mono-energetically operated 1-compressor heat pump (as a rule, air-to-water heat pump) with a single heating circuit without water heating through the heat pump (see page 49)

## 4.2 Configuration of the heat pump heating system

At the configuration level, the menus "Outputs", "Inputs", "Special functions" and "Modem" can be set in addition to the extended Settings menu.

To access the extended menu level for the installer, proceed as follows:

- simultaneously press (approx. 5 seconds) the key combination (MENUE) and (ENTER).
- select the Settings menu item using the arrow keys and confirm by pressing the ENTER key.

The complete "Settings" menu incorporates the following setting options:

Settings	Setting of all system-specific parameters	Setting range	Display
Time	Menu for setting the clock. No automatic changeover from daylight saving to winter time occurs.		Always
Mode	Various operating mode settings.		Always
Operating mode	Selection of the operating mode (corresponds to the mode key)	Cooling Summer <b>Auto</b> Party Holiday 2 <sup>nd</sup> heat gen.	Always
Party mode No. of hours	Duration of party mode	0 ... 4 ... 72	Always
Holiday mode No. of days	Duration of holiday mode	0 ... 15 ... 150	Always
Heat pump	Heat pump settings		Always
No. of compressors	This setting is dependent upon the HP type; the applicable number is to be taken from the mounting and operating manual of the heat pump.	1 2	not revers.

Settings	Setting of all system-specific parameters	Setting range	Display
Oper. temp. limit	This setting is dependent upon the HP type; the applicable temperature limit is to be taken from the mounting and operating manual of the heat pump.	-20°C -15°C	Air HP
HP Pressostat	This setting is dependent upon the HP type; if necessary, the applicable actuating direction is to be set in accordance with Table 4.1.	normally closed normally open	Always
LP Pressostat	This setting is dependent upon the HP type; if necessary, the applicable actuating direction is to be set in accordance with Table 4.1.	normally closed normally open	Always
Suppl. heat source	Settings for the suppl. heat source intended as a backup system of the heat pump heating operation for bivalent and single energy systems		Biv./single energy
HS 2 Limit value	The suppl. heat source is – depending on the dimensioning of the heat pump system – only required from a given limit temperature onward. The suppl. heat source is not switched on unless the temperature falls below the preset limit temperature	-20°C ... -5°C ... +20°C	Biv./single energy
HS 2 Operating mode	Depending on the suppl. heat source used, associated control settings should be made.	Variable Constant	Bivalent
HS 2 Mixer Runtime	Depending on the mixer used, the runtime between the final positions OPEN and CLOSED will vary. To achieve optimum temperature control results, the precise mixer runtime should be entered.	1 min ... 4min ... 6 min	Bivalent
HS 2 Mixer Hysteresis	The hysteresis of the mixer valve represents the neutral zone for the operation of the suppl. heat source. If the setpoint temperature plus hysteresis is reached, the mixer closes so that less water from the boiler flow pipe is added. If the setpoint temperature minus hysteresis is fallen short of, the mixer opens so that more water from the boiler flow pipe is added.	0,5K ... 2K	Bivalent.
Util. comp. off-period	This setting reflects the behaviour of the suppl. heat source during utility company off-periods.  Utility comp. 1: During the utility company off-period, the suppl. heat source in bivalent systems is only enabled at level B3 below the limit temperature of the suppl. heat source. In single energy systems, the suppl. heat source is permanently disabled.  Utility comp. 2: The suppl. heat source is enabled during the utility company off-period.  Utility comp. 3: The suppl. heat source is enabled if the contact is open and the outside temperature has fallen below the Utility comp.3 (UC3) limit temperature (the limit temperature can be entered under the next menu item). Switching behaviour of Utility comp.3 above the limit temperature is as described for Utility comp.1, and below the limit temperature, as described for Utility comp.2. In monovalent and single energy systems, this value cannot be changed, it is firmly set to Utility comp.1.	Utility comp.1 Utility comp. 2 Utility comp. 3	Bivalent
Lim. temp. UC 3	This is the associated limit temperature for the Utility comp.3 setting.	-10°C ... 0°C ... +10°C	Bivalent Utility comp.3
HS 2 Special program	The special program is to be used for old oil burners or in bivalent systems with central storage tanks in order to prevent corrosion caused by condensation.	No Yes	Biv./Single energy
Heating circuit 1	Settings for heating circuit 1		Heating circuit 1
HC 1 Heating curve End point	The heating curve end point is to be set in accordance with the heating system design. When so doing, the maximum return flow temperature is to be entered, which results from the calculated maximum flow temperature minus the temperature difference within the heating system.	20°C ... 30°C ... 70°C	Heating circuit 1
HC 1 Heating curve Maximum value	For surface and radiator heating systems, various maximum temperatures are permissible. The upper limit of the return setpoint temperature can be set between 40 °C and 70 °C.	40°C ... 50°C ... 70°C	Heating circuit 1
HC 1 Hysteresis Return setp. temp.	The hysteresis of the return setpoint temperature represents the neutral zone for the operation of the heat pump. If the temperature "return setpoint temperature plus hysteresis" is reached, the heat pump cycles off. If the temperature "return setpoint temperature minus hysteresis" is reached, the heat pump cycles on. The lower the hysteresis, the more frequently the heat pump cycles on.	0,5K ... 2K ... 5K	Heating circuit 1

Settings	Setting of all system-specific parameters	Setting range	Display
HC 1 Heating PUMP Optimisation	If optimisation (YES) is selected, the controller cycles the heating water circulating pump on and off, as required. If optimisation (NO) is selected, the heating water circulating pump is operated in the continuous mode.	Yes No	Heating circuit 1
HC 1 Fixed-setp. control	The "Fixed-setp. control" (YES) function corresponds to the setting of a horizontal heating characteristic curve. The return setpoint temperature remains at a fixed value regardless of the outside temperature.	No Yes	Heating circuit 1
HC 1 fixed-setp.control Return setp. temp.	Setting of the desired return setpoint temperature after fixed setpoint control has been selected.	15°C ... 40°C ... 60°C	Heating circuit 1 Fixed setp. control HC 1
HC 1 Time Programm Reduction	All settings for lowering the heating curve of heating circuit 1		Heating circuit 1
HC 1 Setback Start	To set the time at which temperature setback of heating circuit 1 is to be started.	00:00 ... 23:59	Heating circuit 1
HC 1 Setback End	To set the time at which the temperature setback period of heating circuit 1 is to be terminated.	00:00 ... 23:59	Heating circuit 1
HC 1 Setback Setback value	To set the temperature value by which the heating curve of heating circuit 1 is to be lowered during a setback period.	0K ... 19K	Heating circuit 1
HC 1 Setback MO ... SU	It is possible to select individually for each day of the week whether a temperature setback is to become active. Setback periods over multiple days are always activated or deactivated upon day changeover.	N Y	Heating circuit 1
HC 1 Time Program Temp. rise	All settings for raising the heating curve of heating circuit 1		Heating circuit 1
HC 1 Temp. rise Start	To set the time at which the temperature increase of heating circuit 1 is to be started.	00:00 ... 23:59	Heating circuit 1
HC 1 Temp. rise End	To set the time at which the temperature increase of heating circuit 1 is to be terminated.	00:00 ... 23:59	Heating circuit 1
HC 1 Temp. rise Rise value	To set the temperature value by which the heating characteristic curve of heating circuit 1 is to be raised during a setback period.	0K ... 19K C	Heating circuit 1
HC 1 Temp. rise MO ... SU	It is possible to select individually for each day of the week whether a temperature rise is to become active. Any temperature rise period over multiple days is always to be activated or deactivated upon day changeover.	N J	Heating circuit 1
Heating circuit 2	Settings for heating circuit 2		Heating circuit 2
HC 2 Heating curve End point	The heating curve end point is to be set in accordance with the heating system design. When so doing, the maximum return temperature is to be entered, which results from the calculated maximum flow temperature minus the temperature difference within the heating system.	20°C ... 30°C ... 70°C	Heating circuit 2
HC 2 Heating curve Maximum value	For surface and radiator heating systems, various maximum temperatures are permissible. The upper limit of the return setpoint temperature can be set between 40 °C and 70 °C.	40°C ... 50°C ... 70°C	Heating circuit 2
HC 2 Mixer Hysteresis	The hysteresis of the mixer valve represents the neutral zone for the operation of the mixer of heating circuit 2. If the setpoint temperature plus hysteresis is reached, the mixer closes so that less water from the flow pipe is added. If the setpoint temperature minus hysteresis is fallen short of, the mixer opens so that more water from the flow pipe is added.	0,5K ... 2K	Heating circuit 2
HC 2 Mixer Runtime	Depending on the mixer valve used, the runtime between the final positions OPEN and CLOSED will vary. To achieve optimum temperature control results, the precise mixer runtime should be entered.	1 min ... 4min ... 6 min	Heating circuit 2
HC 2 Mixer Boost	This setting may be changed for optimisation of the mixer control in different heating systems.	1 ... 5	Heating circuit 2
2nd HC Fixed-setp. control	The "Fixed-setp. control" (YES) function corresponds to the setting of a horizontal heating characteristic curve. The return setpoint temperature remains at a fixed setpoint regardless of the outside temperature.	No Yes	Heating circuit 2
HC 2 fixed-setp. control Setpoint temperature	Setting of the desired setpoint temperature after fixed setpoint control has been selected.	15°C ... 40°C ... 60°C	Heating circuit 2 Fixed value. HC 2

Settings	Setting of all system-specific parameters	Setting range	Display
HC 2 warmer /colder	This setting serves to adjust the temperature to individual comfort levels (for heating circuit 2) (in accordance with the setting indicated on the main screen) If a higher temperature level is to be attained, the slide bar needs to be moved to the right using the Up key. If a lower temperature level is to be attained, the slide bar needs to be moved to the left using the Down key.	bar	Heating circuit 2
HC 2 Time Program Setback	All settings for lowering the heating curve of heating circuit 2		Heating circuit 2
HC 2 Setback Start	To set the time at which the temperature setback of heating circuit 2 is to be started.	00:00 ... 23:59	Heating circuit 2
HC 2 Setback End	To set the time at which the temperature setback of heating circuit 2 is to be terminated.	00:00 ... 23:59	Heating circuit 2
HC 2 Setback Setback value	To set the temperature value by which the heating curve of heating circuit 2 is to be lowered during setback period..	0K ... 19K	Heating circuit 2
HC 2 Setback MO ... SU	It is possible to select individually for each day of the week whether a setback is to become active. Setback periods over multiple days are always activated or deactivated upon day changeover.	N Y	Heating circuit 2
HC 2 Time Program Temp. rise	All settings for raising the heating characteristic curve of heating circuit 2		Heating circuit 2
HC 2 Temp. rise Start	To set the time at which the temperature increase of heating circuit 2 is to be started.	00:00 ... 23:59	Heating circuit 2
HC 2 Temp. rise End	To set the time at which the temperature increase of heating circuit 2 is to be terminated.	00:00 ... 23:59	Heating circuit 2
HC 2 Temp. rise Rise value	To set the temperature value by which the heating curve of heating circuit 2 is to be increased for a specific period.	0K ... 19K	Heating circuit 2
HC 2 Temp. rise MO ... SU	It is possible to select individually for each day of the week whether an increase is to become active. Temperature rise periods over multiple days are always activated or deactivated upon day changeover.	N Y	Heating circuit 2
Heating circuit 3	Settings for heating circuit 3		Heating circuit 3
HC 3 Heating curve End point	The heating curve end point is to be set in accordance with the heating system design. When so doing, the maximum return temperature is to be entered, which results from the calculated maximum flow temperature minus the temperature difference within the heating system (spread).	20°C ... 30°C ... 70°C	Heating circuit 3
HC 3 Heating curve Maximum value	For surface and radiator heating systems, various maximum temperatures are permissible. The upper limit of the return setpoint temperature can be set between 40 °C and 70 °C.	40°C ... 50°C ... 70°C	Heating circuit 3
HC 3 Mixer Hysteresis	The hysteresis of the mixing valve represents the neutral zone for the operation of the mixer of heating circuit 3. If the setpoint temperature plus hysteresis is reached, the mixer closes so that less water from the flow pipe is added. If the setpoint temperature minus hysteresis is fallen short of, the mixer opens so that more water from the flow pipe is added.	0,5K ... 2K	Heating circuit 3
HC 3 Mixer Runtime	Depending on the mixing valve used, the runtime between the final positions OPEN and CLOSED will vary. To achieve optimum temperature control results, the precise mixer runtime should be entered.	1 min ... 4min ... 6 min	Heating circuit 3
HC 3 Mixer D component	This setting can be changed for optimisation of the mixer control rate in different heating systems (1 = slow, 5 = dynamic).	1 ... 2 ... 5	Heating circuit 3
HC 3 Fixed-setp. control	The "Fixed-setp. control" (YES) function corresponds to the setting of a horizontal heating curve. The setpoint temperature remains at a fixed setpoint regardless of the outside temperature.	No Yes	Heating circuit 3
HC 3 colder / warmer	This setting serves to adjust the temperature to individual comfort levels (for heating circuit 3) (in accordance with the setting indicated on the main screen) If a higher temperature level is to be attained, the slide bar needs to be moved to the right using the Up key. If a lower temperature level is to be attained, the slide bar needs to be moved to the left using the Down key.	bar	Heating circuit 3
HC 3 Time Program Setback	All settings for lowering the heating curve of heating circuit 3		Heating circuit 3

Settings	Setting of all system-specific parameters	Setting range	Display
HC 3 Setback Start	To set the time at which the temperature setback of heating circuit 3 is to be started.	00:00 ... 23:59	Heating circuit 3
HC 3 Setback End	To set the time at which the temperature setback of heating circuit 3 is to be terminated.	00:00 ... 23:59	Heating circuit 3
HC 3 Setback Setback value	To set the temperature value by which the heating curve of heating circuit 3 is to be lowered during a setback period.	0K ... 19K	Heating circuit 3
HC 3 Setback MO ... SU	It is possible to select individually for each day of the week whether a setback is to become active. Setback periods over multiple days are always activated or deactivated upon day changeover.	N J	Heating circuit 3
HC 3 Time Program Temp. rise	All settings for raising the heating characteristic curve of heating circuit 3		Heating circuit 3
HC 3 Temp. rise Start	To set the time at which the temperature increase of heating circuit 3 is to be started.	00:00 ... 23:59	Heating circuit 3
HC 3 Temp. rise End	To set the time at which the temperature increase of heating circuit 3 is to be terminated.	00:00 ... 23:59	Heating circuit 3
HC 3 Temp. rise Rise value	To set the temperature value by which the heating curve of heating circuit 3 is to be increased during a specific period.	0K ... 19K	Heating circuit 3
HC 3 Temp. rise MO ... SU	It is possible to select individually for each day of the week whether a temperature increase is to become active. Temperature rise periods over multiple days are always activated or deactivated upon day changeover.	N J	Heating circuit 3
Cooling	Settings for the cooling mode		Cooling function
Cooling Dynamic cooling	Setting that indicates whether the system features a dynamic cooling facility (e.g. fan convector)	No Yes	Cooling function
Dynamic cooling Setpoint (return)	To set the setpoint for the dynamic cooling mode. This temperature corresponds to a fixed return setpoint temperature.	10°C ... 15°C ... 30°C	Cooling function Dyn. cooling
Cooling Silent cooling	Setting that indicates whether the system features a silent cooling facility (e.g. ceiling cooling)	Yes No	Cooling function
Silent cooling No. of room modules	Setting that indicates whether on activation of the silent cooling facility one or two room climate control stations for dew point monitoring are to be used.	1 2	Cooling function Silent cooling
Silent cooling Setpoint (room temp.)	To set the setpoint for the silent cooling mode. This temperature corresponds to the desired temperature in the room in which room climate control station 1 is located.	15.0°C ... 20.0°C ... 30.0°C	Cooling function Silent cooling
Silent cooling Dewpoint difference	To set the dewpoint difference. This value represents the temperature difference between the calculated dewpoint and the HP cut-out value.	1,5 K ... 2,0K ... 5,0K	Cooling function Silent cooling
Hot water	Setting for water heating		Hot water
Hot water Changeover 2nd compr.	To set the outside temperature below which in the case of 2-compressor heat pumps the water heating and swimming pool water heating process is carried out with 2 compressors.	-15°C ... 10°C ... 35°C	Hot water 2 compressors
Hot water Hysteresis	The hysteresis of the hot water setpoint temperature represents the neutral zone for the operation of the heat pump for water heating.	2K ... 15K	Hot water Sensor
Hot water Parallel heating - DHW	Setting that indicates whether in HPs with auxiliary heat exchanger a parallel operation of heating and domestic water heating is to be possible. In this way, higher hot water temperatures can be reached.	No Yes	Suppl. heat ex. Hot water Sensor

Settings	Setting of all system-specific parameters	Setting range	Display
Hot water HP max. temp.	To set the maximum hot water temperature the heat pump can produce. It is dependent upon the heating capacity of the heat pump, the heat exchanger surface installed in the storage tank, and the capacity (volumetric flow rate) of the circulating pump. With this setting, the sensor time lag (reheating) and the hysteresis are to be taken into account as well. The hot water temperature should be set to approx. 10 K below the maximum flow temperature of the heat pump. If the hot water temperature is set too high, the heat pump will automatically switch off on account of the high-pressure safety program and lock out the water heating operation for a period of 2 hours. In installations fitted with a sensor, a correction of the HP maximum temperature is effected, i.e. the new value = current actual value – 1K. The HP max. temp. is the upper limit for adjusting "HW temp. HP mode" in the "Settings" menu option.	30°C ... 45°C ... 55°C	Hot water Sensor
Hot water Parallel cooling - DHW	Setting that indicates whether in the passive cooling mode a parallel operation of cooling and domestic water heating is to be possible.	No Yes	Hot water Sensor Cooling funct. passive
Hot water max. temp. parallel	To set the maximum hot water temperature that is to be attained in the parallel operating mode Heating- Hot water.	10°C ... 45°C ... 80°C	Suppl. heat ex. Hot water Sensor
Hot water HW temp. in HP mode	To set the hot water temperature that is to be attained without the booster heater function activated.	30°C ... 45°C ... WP Max.	Hot water Sensor
Hot water Lockout	The domestic hot water function can be disabled by a time program.		Hot water
Hot water lockout Start	To set the time at which the hot water disable function is to be started.	00:00 ... 23:59	Hot water
Hot water lockout End	To set the time at which the hot water disable function is to be terminated.	00:00 ... 23:59	Hot water
Hot water lockout MO ... SU	It is possible to select individually for each day of the week whether an off-period for water heating is to become active. Off-periods over multiple days are always activated or deactivated upon day change-over.	N Y	Hot water
Hot water Reheating enable	Setting that indicates whether an immersion heater installed in the system is to be enabled for hot water booster heating.	No Yes	Hot water Sensor Immersion heater
Hot water Reheating max.	To set the maximum possible hot water temperature that can be attained during reheating.	WP Max. ... 55°C ... 80°C	Hot water Sensor Immers. heater Reheating
Hot water Reheating time pr.	Reheating must be enabled by a time program.		Hot water Sensor Reheating
DHW reheating Start	To set the time at which reheating is to be enabled.	00:00 ... 23:59	Hot water Sensor Reheating
DHW reheating End	To set the time at which reheating is to be terminated.	00:00 ... 23:59	Hot water Sensor Reheating
DHW reheating MO ... SU	It is possible to select individually for each day of the week whether reheating is to become active. Reheating periods over multiple days are always activated or deactivated upon day changeover.	HP Max. ... 50°C ... Imm. heater max.	Hot water Sensor Reheating
Hot water Rapid heating	Setting that indicates whether a rapid water heating function is to be activated. In this case, the heat pump and immersion heater are activated in a one-through operation until the setpoint value has been reached. This function resets itself automatically.	No Yes	Hot water

Settings	Setting of all system-specific parameters	Setting range	Display
System PUMP control	The 'auxiliary circulating pump' output can be configured so that the auxiliary circulating pump can be operated in parallel with the compressor of the heat pump. This configuration is possible after the settings for space heating, water heating or swimming pool heating have been made. The frost protection functions are ensured.		Always
Auxiliary PUMP during space heating	Do you want the auxiliary pump to be running during the space heating mode?	No Yes	Heating circuit 1
Auxiliary PUMP during water heating	Do you want the auxiliary pump to be running during the water heating mode?	No Yes	Hot water
Auxiliary PUMP during Pool heating	Do you want the auxiliary pump to be running during the swimming pool heating mode?	No Yes	Swimming pool
Date year Day month Weekday	To set the date, year, month and day of the week. No automatic changing of the setting in leap years will occur.		Always
Language	The text of the menu can be selected in six languages: German, French, Italian, English, Dutch and Czech.	DEUTSCH ENGLISH FRANCAIS ITALIANO NEDERLAND CESKY	Always

### 4.2.1 Inputs

The "Inputs" menu presents the status display "contact open or closed" for the following digital inputs, depending on the particular system configuration:

Inputs	Status display of all digital inputs	Display
LP Pressostat	Contact open indicates a fault. <sup>1)</sup>	Always
HP Pressostat	Contact open indicates a fault. <sup>1)</sup>	Always
Defrost end Pressostat	Contact closed indicates 'defrost end'.	Air HP
Freeze protection Thermostat	Contact open indicates a fault.	Brine/water or water/water HP
Hot gas thermostat	Contact open indicates a fault.	Air HP
Flowrate monitoring	Contact open indicates a fault (insufficient flowrate)	Water HP
Motor protection Compressor	Contact open indicates a fault.	Always
Motor protection Primary PUMP	Contact open indicates a fault.	Always
Low pressure Pressostat brine	Contact open indicates a fault.	Sole ND
Util. comp. shut-off	Contact open indicates an electric utility company off-period.	Always
Ext. disable contact	Contact open indicates a shut-off condition.	Always
Dew Point monitor	Contact open indicates a fault.	Cooling function Passive cooling
Hot water Thermostat	Contact closed indicates a call for hot water.	Hot water Thermostat
Swimming Pool Thermostat	Contact closed indicates a call for pool heating.	Swimming pool

<sup>1)</sup> Applies to all heat pumps with a manufacturing date FD8404 and later.

All other heat pumps have to be set in accordance with the table below:

Heat pump type	High-pressure pressostat	Low-pressure pressostat
LI / LA	normally open contact	normally open contact
SI / WI	normally open contact	normally closed contact
High temperature	normally open contact	normally closed contact

**Table 4.1:** Actuating direction of pressostats (for HP with a manufacturing date earlier than FD8404)

## 4.2.2 Outputs

The "Outputs" menu presents the status display "Off or On" for the following outputs, depending on the particular system configuration:

Outputs	Display
Compressor 1	Always
Compressor 2	2 compressors
Four-way valve	Cooling function Air HP
Fan / Primary PUMP	Always
Primary PUMP Cooling	Passive cooling function
SUPPL. heat source	Biv./single energy
Mixer open SUPPL. heat source	Bivalent
Mixer closed SUPPL. heat source	Bivalent
Mixer open Heating circuit 3	Heating circuit 3
Mixer closed Heating circuit 3	Heating circuit 3
Heating PUMP	Always
Heating PUMP Heating circuit 1	Cooling function

Outputs	Display
Heating PUMP Heating circuit 2	Heating circuit 2
Mixer open Heating circuit 2	Heating circuit 2 or Cooling mode during strictly passive cooling with rev. HP
Mixer closed Heating circuit 2	Heating circuit 2 or Cooling mode during strictly passive cooling with rev. HP
Auxiliary PUMP	Always
Cooling PUMP	Passive cooling function
Changeover Room thermostats	Cooling function
Changeover valves Cooling	Passive cooling function
Hot water PUMP	Hot water
Immersion heater	Hot water Sensor Immersion heater
Swimming pool PUMP	Swimming pool

### 4.2.3 Special functions

The "Special functions" menu provides, depending on the system configuration, the following possibilities for changing the current operating states:

**⚠ Caution!**

Special functions may only be activated by a qualified expert in order to carry out commissioning activities or an analysis of the heat pump system.

Special functions	Activation of special functions	Setting range	Display
Compressor change	In the case of 2-compressor heat pumps, activating the "Compressor change" function allows a changeover of the compressors to be carried out during operation.	No Yes	2 compressors
Quick start	Activating the "Quick start" function enables the heat pump to start up after the safety-relevant time periods have elapsed. The anti-short cycling switching cycle lock-out will be ignored.	No Yes	Always
Deactivate LOL	Activating the "Deactivate LOL" (= low operating limit) function enables the heat pump to start up after the safety-relevant time periods have elapsed. Any preset time periods for energy-optimised heat pump operation will be ignored.	No Yes	Brine/water-HP
Commissioning	The "Commissioning" function can be activated for air-to-water heat pumps only. When this function is activated, the defrost function will be suppressed for one hour, any already-started defrost action will be aborted. The supplementary heat source will be enabled during this 1-hour period.	No Yes	Air HP
Initial heating program	Automated program specifically designed for screed drying.		Always
Initial heating program Maximum temperature	To set the maximum return temperature that is to be attained during initial heating.	25°C ... 40°C ... 50°C	Always
Hot water / Swimm. Pool active	Selecting this function allows any possible call for hot water or pool heating to be met while the pre-heating function is active.	No Yes	Always
UFH funct. check	To activate the program for performing a functional check of the underfloor heating facility.	No Yes	Always
Standard program Heat./screed drying	To activate the standard program for screed drying before floor covering is applied.	No Yes	Always
Individual program Heating-up period	To set the duration of the individual steps of the heating-up phase.	1 ... 24 ... 120	Always
Individual program Temp. maint. period	To set the time period during which the temperature is to be maintained.	1 ... 96 ... 480	Always
Individual program Heat reduction period	To set the duration of the individual steps of the heat-reduction phase.	1 ... 24 ... 120	Always
Individual program Heat-up temp. diff.	To set the temperature difference between the individual steps in the heating-up phase.	1K ... 5K ... 10K	Always
Individual program Heat-reduct. temp. diff.	To set the temperature difference between the two steps in the heat-reduction phase.	1K ... 5K ... 10K	Always
Individual program Heat./screed drying	Activation of the individual heating program for screed drying.	No Yes	Always

## 4.2.4 Modem / PC-connection

The required configuration of the modem can be set in the "Modem" menu. The installation instructions are contained in the installation manual of the remote diagnosis system used. All

changes to the factory settings must be carefully checked since an existing connection may possibly be interrupted.

Modem	Adaptation of the serial interface to the remote diagnosis	Setting range	Display
Baud rate	Selection of the baud rate at which the data are exchanged via the serial interface. Make sure that the same baud rate is set on communication sides.	19200 9600 4800 2400 1200	Always
Address	Each connection can be assigned an address. Under normal conditions, this value should remain at a setting of 0.	0 ... 199	Always
Protocol	The Protocol setting indicates which type of remote diagnosis is used (Local or Modem)	Local Remote GSM	Always
Password	The remote diagnosis function can be password-protected.	0 ... 1234 ... 9999	Always
Phone number	This function is not used as yet.		Always
Dialing method	To set the type of dialling mode for the phone line by means of which a remote diagnosis via modem is carried out.	Tone Pulse	Always
No. of rings before modem answers	Setting to indicate after how many rings the controller answers in order to provide remote diagnosis.	0 ... 1 ... 9	Always
Manual dialing	This function is not used as yet.	No Yes	Always

## 4.3 Energy-efficient operation

Heating operation is performed as a function of the outside temperature. The controller calculates a return setpoint temperature from the preset heating characteristic and the current outside temperature measured on the outside wall.

The heating curve should be adjusted in such a way that – depending upon the heating system (surface heating or radiators), the building structure and local conditions – the desired room temperatures are reached at all times without any unnecessarily high temperature levels being attained.

### Control via the return temperature

The control of a heat pump heating system via the return temperature offers the following advantages:

- 1 Longer operating times of the heat pump, also without parallel buffer.
- 2 Capturing the disturbance variable of the heating system (e.g. passive solar gains).
- 3 With a low heat demand, the lower temperature difference automatically results in lower flow temperatures and hence more efficient operation.

### ☛ Energy-efficient operation

**The heating curve should be set as high as necessary and as low as possible!**

## 4.4 Setting the heating curve

The heating curve needs to be adapted – separately for heating circuits 1 and 2 – to the local conditions and the building structure so that the desired room temperature will be reached even with changing outside temperatures. When the outside temperature is rising, the return setpoint temperature is lowered thus ensuring the energy-efficient operation of the heating system.

1. In the menu "Settings – Heating curve - End point" the max. required return temperature at an outside temperature of  $-20^{\circ}\text{C}$  is entered. The aim is to reach an average, constant room temperature even though the outside temperatures are changing.
2. All heating curves intersect at an outside wall temperature of  $+20^{\circ}\text{C}$  and a return temperature of  $+20^{\circ}\text{C}$ , which means that

there is no heating demand in this operating point. By means of the slide bar (Warmer  $\uparrow$  and Colder  $\downarrow$  keys) this operating point can be shifted between  $5^{\circ}\text{C}$  and  $30^{\circ}\text{C}$  along the inclined axis. This results a parallel shift of the entire heating curve in upward or downward direction by a constant amount of approx.  $1\text{K}$  per slide bar unit. The user can thus set the temperature he wishes to maintain for his personal comfort.

3. The upper limit of every heating curve is the value that was entered in "Settings – Heating circuit 1/2 – Heating curve maximum". The lower limit of every heating curve is a value of  $15^{\circ}\text{C}$  (air HP) or  $18^{\circ}\text{C}$  (brine or water HP).

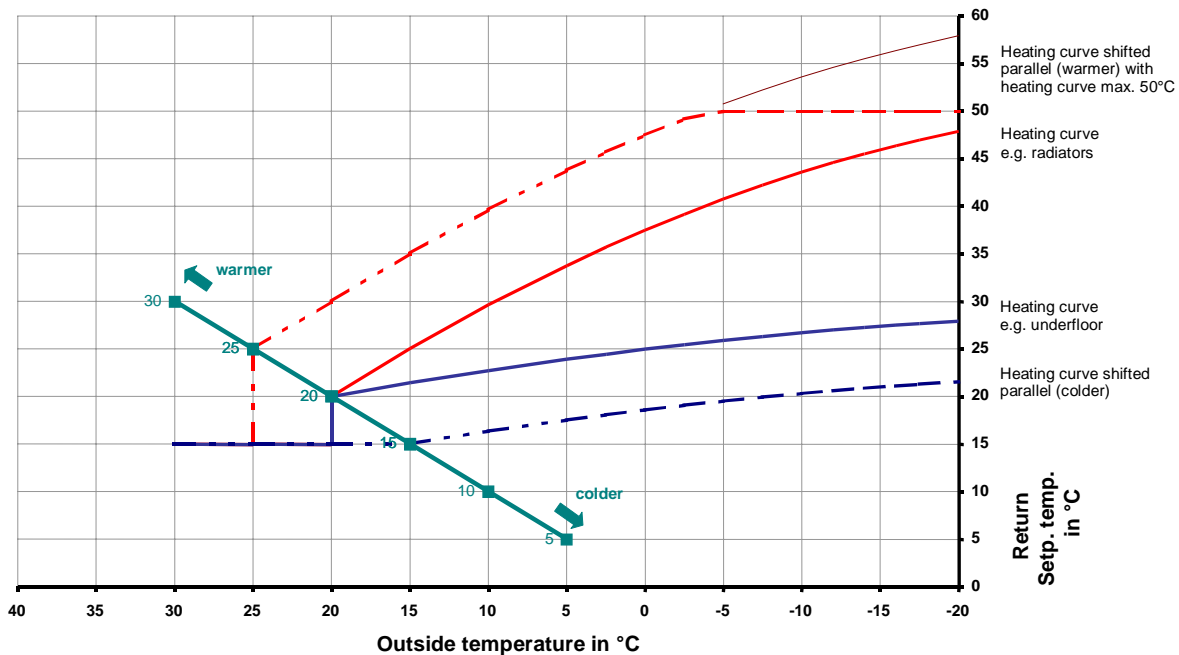


Fig. 4.1: Options for setting the heating curve

### ☛ Heating curve

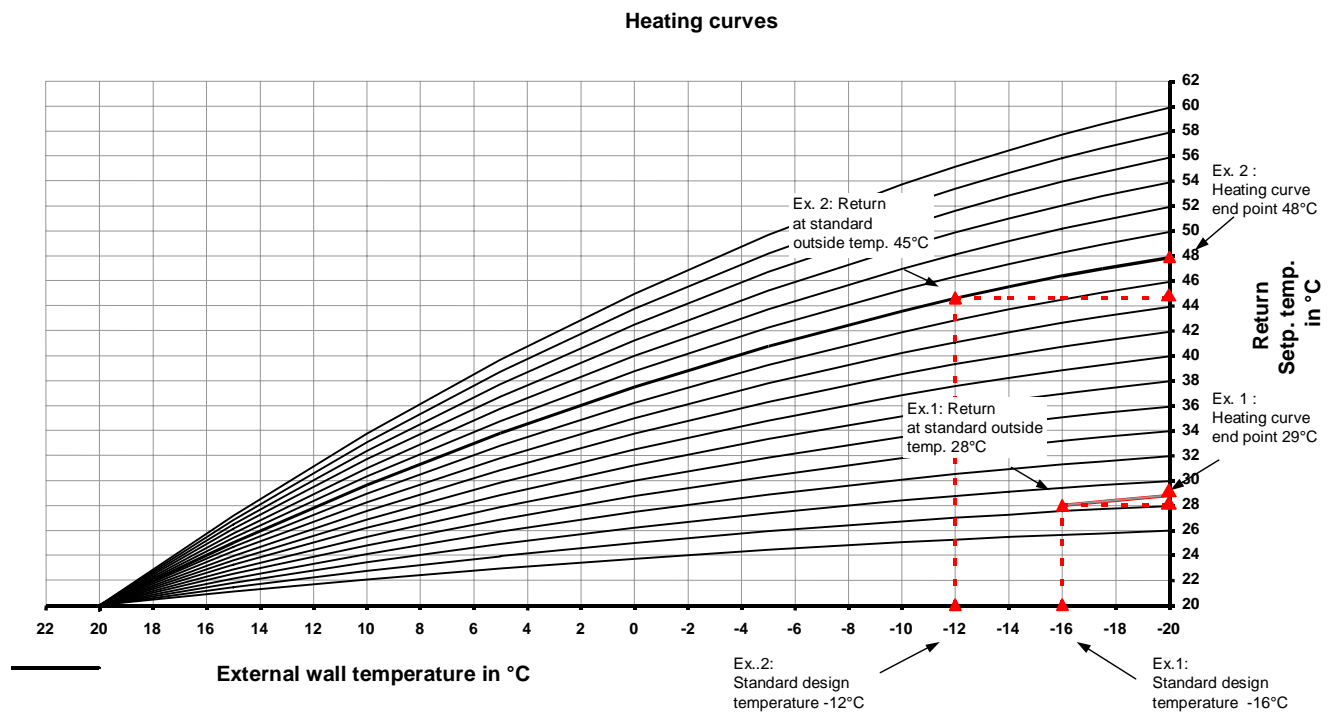
- Step 1: Adjustment of the heating curve to local conditions and the building structure by setting the slope (heating curve end point)
- Step 2: Adjustment of the desired temperature level by parallel displacement of the heating curve in upward or downward direction (warmer/colder slide bar).

#### 4.4.1 Setting examples

	Underfloor heating 35 °C / 28 °C			Radiators 55 °C / 45 °C		
Standard outside temperature °C	-12	-14	-16	-12	-14	-16
Required flow temperature (at standard design temperature)	35°C	35°C	35°C	55°C	55°C	55°C
Flow / return temperature difference	7°C	7°C	7°C	10°C	10°C	10°C
Required return temperature (at standard design temperature)	28°C	28°C	28°C	45°C	45°C	45°C
<b>Heating curve end point to be set</b>	<b>30°C</b>	<b>29°C</b>	<b>29°C</b>	<b>48°C</b>	<b>47°C</b>	<b>46°C</b>
	<b>Example 1</b>			<b>Example 2</b>		

A heat distribution system (e.g. underfloor heating) is designed for a maximum flow temperature at a given standard outside temperature. The latter is dependent upon the heat pump site and lies in Germany between  $-12$  and  $-16^{\circ}\text{C}$ . The max. return temperature to be set at the heat pump controller must be entered at an out-

side temperature of  $-20^{\circ}\text{C}$ . To this end, the maximum return temperature at the given standard outside temperature must be entered. The setting of  $-20^{\circ}\text{C}$  can be read off the group of curves.



**Fig. 4.2:** Heating curves

#### 4.4.2 Heating curve optimisation

For heating curve optimisation, two setting options are available:

- Change of the gradient through higher or lower "heating curve end point"
- Raising or lowering the complete heating curve using the Warmer  $\uparrow$  and Colder  $\downarrow$  keys)

When	External wall temperature		
	below $-7^{\circ}\text{C}$	$-7$ to $+7^{\circ}\text{C}$	above $+7^{\circ}\text{C}$
too cold	"Heating curve end point" value higher by $2^{\circ}\text{C}$ - $3^{\circ}\text{C}$	Warmer ( $\uparrow$ ) / colder ( $\downarrow$ ) by $1^{\circ}\text{C}$ to $2^{\circ}\text{C}$ scale graduations higher	Warmer ( $\uparrow$ ) / colder ( $\downarrow$ ) by $1^{\circ}\text{C}$ to $2^{\circ}\text{C}$ higher and "Heating curve end point" by $2^{\circ}\text{C}$ to $3^{\circ}\text{C}$ lower
too hot	"Heating curve end point" value lower by $2^{\circ}\text{C}$ - $3^{\circ}\text{C}$	Warmer ( $\uparrow$ ) / colder ( $\downarrow$ ) by $1^{\circ}\text{C}$ to $2^{\circ}\text{C}$ scale graduations lower	Warmer ( $\uparrow$ ) / colder ( $\downarrow$ ) by $1^{\circ}\text{C}$ to $2^{\circ}\text{C}$ scale graduations lower and "Heating curve end point" by $2^{\circ}\text{C}$ to $3^{\circ}\text{C}$ higher

#### 4.4.3 Fixed-setpoint control / setting of a horizontal heating characteristic

In special applications (e.g. buffer tank heating to a constant temperature) it is possible to set an **outside temperature-independent heating curve** (horizontal line). The selection is effected in the menu "Settings – Heating circuit 1 (2) –

Fixed setp. control". The desired return setpoint temperature can be set in the subsequent menu item "Fixed setp. control – Return setp. temp." at between  $15^{\circ}\text{C}$  and  $60^{\circ}\text{C}$ .

## 4.5 Water heating

Domestic water heating is effected via hot water tanks with adequately sized heat exchange surfaces in order to be able to transfer the maximum heating capacity of the heat pump on a permanent basis.

To this end, the storage tanks are usually fitted with a sensor which are to be connected directly to the heat pump controller. The sensor characteristic corresponds to DIN 44574.

Temperature control and time-controlled booster heating by means of an immersion heater is effected by the heat pump controller.

### Control via thermostat

As an alternative, the control can be effected via a thermostat. In this type of application, no controlled booster heating by means of a heating element is possible.

#### ☛ Water heating using heat pumps fitted with an additional heat exchanger

The control of heat pumps fitted with an additional heat exchanger in the hot gas (e.g. reversible heat pumps) is described in Chapter 1.

### 4.5.1 Maximum storage tank temperatures

The maximum water temperature that can be reached by means of the heat pump is dependent upon:

- the heating capacity of the heat pump
- the installed heat exchanger surface, and

- the volumetric flow rate in the heat exchanger.

The selection of the hot water tank must be based on the max. heating capacity of the heat pump (summer mode) and the desired storage tank temperature (e.g. 45°C).

### 4.5.2 Water heating terms

HW temp. in HP mode:	Temperature in the hot water tank that is to be attained if no reheating is active.
HP maximum:	Maximum hot water temperature that can be reached in the pure heat pump mode.
Reheating:	To reach a temperature in the hot water tank that is higher than 'HP maximum' by activating an immersion heater.
Max. reheating:	Maximum permissible temperature to be reached in the hot water tank by reheating.
Reheating temperature:	The reheating temperature set for the applicable day of the week.

### 4.5.3 Setting of hot water generation without reheating

Menu	Submenu	Set value
Pre-configuration	Water heating	Yes
Pre-configuration	Immersion heater	No
Settings	HP maximum temp.	approx. 10°C below the maximum flow temperature of the heat pump

The user settings are to be made in accordance with Chapter 3.1.8 Hot water heating.

### 4.5.4 Setting of hot water generation with reheating

Menu	Submenu	Set value
Pre-configuration	Hot water generation	Yes
Pre-configuration	Immersion heater	Yes
Settings	Hot water HP maximum temp.	approx. 10°C below the maximum flow temperature of the heat pump
Settings	Hot water reheating	Yes
Settings	Hot water reheating max.	Adjustable up to max. 80°C

The user settings are to be made in accordance with Chapter 3.1.8 Hot water heating.

#### 4.5.5 Automatic adaptation of the max. temperature in the heat pump mode

If the hot water temperature (HP maximum) is set too high, the heat supplied by the heat pump cannot be transferred.

The heat pump controller – via the high-pressure safety program – switches automatically off and disables water heating for 2 hours.

In systems equipped with a sensor, an automatic correction of HP maximum (HP maximum new = current actual temperature in the hot water tank minus 1 K) takes place.

If the set 'HW temp. in HP mode' is higher than 'HP maximum', the 'HW temp. in HP mode' will also be set to 'HP maximum'.

If required, the corrected value may be manually set to a higher value again.

If supplementary heating was enabled in the pre-configuration, a time control for supplementary heating must be programmed (see Chapt. 3.1.8).

#### 4.5.6 Activation of heat pump and immersion heater

The activation of heat pump and immersion heater is effected depending on the settings in PRE-CONFIGURATION and SETTINGS as well as the active bivalence setting in accordance with the chart below:

Immer- sion heater	Enable suppl. heating	Time control suppl. heating	Biva- lence setting	Function heat pump	Function immersion heater
No	-	-	1 / 2 / 3	On until HW temp. in HP mode is reached	Off
Yes	No	-	1 / 2	On until HW temp. in HP mode is reached	Off
Yes	No	-	3	Off	On until HW temp. in HP mode is reached
Yes	Yes	No	1 / 2	On up to HW temp. in HP mode	Off
Yes	Yes	No	3	Off	On until HW temp. in HP mode is reached
Yes	Yes	Yes	1 / 2	If reheating temperature < HP max.: On until reheating temperature is reached	Off
Yes	Yes	Yes	1 / 2	If reheating temperature > HP max.: On until HP maximum is reached	Activated until reheating temperature is reached
Yes	Yes	Yes	3	Off	On until heating temperature is reached

<sup>1)</sup> The switching behaviour for bivalence setting 3 applies to a bivalent system. In single-energy systems, it is imperative that a heating element be installed in the hot water tank.

#### Important:

- The thermostat integrated at the immersion heater must be set to a sufficiently high value.
- If in the Pre-configuration no water heating or request by thermostat was selected, the immersion heater will not be activated.
- Programmed off-times for water heating are retained.
- Reheating is possible during a high-pressure hot water lockout.
- If during reheating a utility company shut-off period occurs, or a water heating lock-out (programmed) or a reheating lock-out is activated, then reheating operation will be terminated and reset.
- To prevent the hot water temperature from dropping too low, the preset HW hysteresis value should not exceed 2K.

### 4.5.7 Hot water rapid heating

This function is designed to generate hot water as quickly as possible. To this end, the heat pump (up to the max. programmed temperature) and the immersion heater operate simultaneously in a once-only operation.

Immers. heater	Enable suppl. heating.	Time control suppl. heating	Bivalence setting	Function heat pump	Function Immersion heater
No	-	-	1 / 2 / 3	On up to HW temp. in HP mode	Off
Yes	No	-	1 / 2	On up to HW temp. in HP mode	Off
Yes	No	-	3	On up to HW temp. in HP mode	On up to HW temp. in HP mode
Yes	Yes	No	1 / 2	On up to HP max.	On until reheating temperature is reached
Yes	Yes	No	3	On up to HP max.	On until reheating temperature is reached
Yes	Yes	Yes	1 / 2	On up to HP max.	On until reheating temperature is reached
Yes	Yes	Yes	3	On up to HP max.	On until reheating temperature is reached

For the activation of this function the following options exist:

- Press the "water tap" key on the remote control station
- Select menu item 1 "Settings", Hot water, Rapid heating

Any hot water lock-out that may be active via time-control or any reheating will be ignored.

If there is a malfunction in the heat pump, the immersion heater (if any) is enabled until the setpoint temperature is reached.

## 5 Functional Description

### 5.1 Limit temperature (Balance Point)

The outdoor temperature at which the heat pump can just satisfy the heating demand is referred to as limit temperature or balance point. This point is characterised by the transition from the heat pump-only operation to the bivalent operation in conjunction with the electric heating elements or the boiler.

The theoretical balance point may differ from the optimal one. In particular in spring and autumn (cold nights, warm days) a low balance point may reduce energy consumption in accordance with the preferences and habits of the user. It is therefore possible to set a limit temperature on the heat pump controller in the menu "Settings – Suppl. heat source – Limit value" in order to enable the suppl. heat source.

Normally, the limit temperature is only used in monoenergetic (single energy) systems with air-to-water heat pumps, or in bivalent systems in combination with an oil or gas furnace.

In the single energy mode, a limit temperature of  $-5^{\circ}\text{C}$  is strived for. The limit temperature is determined from the outside temperature-dependent building demand and the heating performance curve of the heat pump. Additional information for determining the heat pump performance and the limit temperature is contained in the heat pump Project planning and Installation manual.

If "Operating mode bivalent-alternat." was set during pre-configuration, the heat pump will be locked out if the outside temperature falls below the limit temperature. The message 'Oper. temp. limit' appears on the display.

### 5.2 Heating water hysteresis

The hysteresis of the heating controller can be set in the menu "1 SETTINGS". The hysteresis forms a "neutral zone" around the return setpoint temperature. If the return temperature is lower than the setpoint temperature reduced by the hysteresis, a call for "more heat" exists. This heat demand continues to exist until the return temperature has exceeded the upper limit of the neutral zone. This results in a hysteresis around the setpoint. If the hysteresis is large, the heat pump will run longer with relatively high tem-

perature fluctuations in the return flow. With a small hysteresis, the runtime is reduced and the temperature fluctuations are lower.

**Note:**

For surface heating systems with relatively flat characteristics, a hysteresis of approx. 1K should be set, since the heat pump can be prevented from switching on if the hysteresis is too large.

### 5.3 Service interruption by energy providers

A prerequisite for low tariffs for electric service provided by utility companies (UC) is a temporary interruption of service to the heat pump. During a utility company interruption period, voltage to the heat pump is interrupted at terminal ID3.

In systems without UC interruption function, the supplied jumper wire must be placed across the relevant terminals.

In bivalent systems, different responses to UC interruption periods are possible:

UC1: The supplementary heat source is enabled at setting B3 (see 5.4.1) only.

UC2: The supplementary heat source is enabled unconditionally.

Alternatively, the outside temperature-dependent CU3 interruption can be used. At outside temperatures below the CU3 limit temperature, the supplementary heat source is enabled. The setting of the UC interruption must be made in the menu "Settings - Suppl. heat source – Util. comp. off-period".

In single energy and monovalent systems, the supplementary heat source is always disabled during a UC interruption. The setting of the UC interruption is dimmed.

## 5.4 Performance control / activation of the heat generators

### 5.4.1 Bivalence settings

The heat pump controller maximally defines 3 bivalence settings: B1, B2 and B3. These settings are activated according to the prevailing heating demand. With increasing heating demand, the system switches to the next higher performance setting, when the heating demand decreases, a switchover to the next lower performance setting takes place.

- B1: Heat pump is operating with one compressor
- B2: Heat pump is operating with two compressors
- B3: Heat pump is operating and suppl. heat source is activated (not for monovalent systems)

#### 5.4.1.1 Heat pumps with a single compressor

Criteria for changeover:

- from B1 to B3 if the heating controller calls for "more heat" for more than 60 minutes, and at the same time the outside tempera-

ture falls below the limit temperature of the suppl. heat source for more than 60 minutes,

- from B3 to B1 if the heating controller calls for "less heat" for more than 15 minutes, or if the limit temperature has been exceeded.

#### 5.4.1.2 Heat pumps with two compressors

- from B1 to B2 if heating controller calls for "more heat" for more than 25 min.,
- from B2 to B3 if heating controller calls for "more heat" for more than 60 min. and simultaneously the outside temperature is below the limit temperature for more than 60 min.
- from B3 to B2 or B1 if the heating controller calls for "less heat" for more than 15 minutes, or the limit temperature has been exceeded,
- from B2 to B1 if the heating controller calls for "less heat" for more than 15 minutes.

In bivalence setting B1 the compressor of the heat pump is cycled on and off as a function of the "more" or "less" signals received from the

heating controller. In setting B2, one compressor of the heat pump operates continuously to cover the base load. The second compressor cycles on and off as a function of the "more" or "less" signals of the heating controller. In setting B3, both compressors operate continuously in order to cover an increased base load, the second heat exchanger operates in the controlled mode. In the defrost mode, only one compressor is operating. For water heating and swimming pool heating with air-to-water heat pumps, one or two compressors are operating, depending on the outside temperature.

#### 5.4.1.3 Special cases

- After commissioning or after a power failure, the heat pump controller always starts in bivalence setting B1.
- Upon a changeover from the "Supplementary heat source" to the "Automatic" operating mode, the controller starts in setting B1 in the case of heat pumps with one com-

pressor and in setting B2 in the case of heat pumps with two compressors.

- The performance settings are not redefined during defrost, swimming pool heating, a call for hot water or a utility company interruption.

#### 5.4.1.4 Low and high-temperature heat pumps with 2 compressors

##### Low-temperature heat pumps

To ensure optimum operation of the entire heat pump system, the compressors and the supplementary heat source are used, depending on the performance setting and the heat demand. The

table below displays the defined states of low-temperature heat pumps possessing 2 compressors.

Bivalence setting	Heat pump with one compressor	Heat pump with two compressors
Setting B1	only one compressor is cycling on/off	only one compressor is cycling on/off
Setting B2	-	1 compressor f. base load, 1 compressor cycling on/off
Setting B3	one compressor and suppl. heat source, if necessary	both compressors and suppl. heat source, if required
Defrost	compressor is operating	one compressor is operating
Water heating	compressor is operating	in air-to-water heat pumps one or two compressors are operating, depending on the outside temperature
Swimming pool heating	compressor is operating	in air-to-water heat pumps one or two compressors are operating, depending on the outside temperature

## High-temperature heat pumps

At external wall temperatures above 10°C, generally only 1 compressor is operating. If the external wall temperature is below 10°C and the flow temperature is higher than 50°C, both compressors are enabled:

First, the 1<sup>st</sup> compressor is activated and shortly thereafter the 2<sup>nd</sup> compressor. If the request is cancelled or if an interruption becomes active, both compressors are deactivated at the same time.

### 5.4.2 Call for supplementary heat source

If the outside temperature (measured at the external wall) is above the set limit temperature (cf. 5.1), the supplementary heat source is not required.

If the outside temperature is below the set limit temperature, the supplementary heat source is enabled, provided the heat pump controller has switched to bivalence setting B3 and a call for heat exists.

According to the tariff regulations of various energy providers and the Federal Electricity Supply Regulations, it must be possible to interrupt the service of electricity to heat pumps at given times (**utility company interruption**). During this period, the supplementary heat source of heating systems is enabled if in the menu "Settings – Suppl. heat source – Type Util. comp. off-period" the setting UC2 was specified. Whether the supplementary heat source has to

be enabled permanently, outdoor temperature-dependent or not at all, depends on the local conditions and the building structure as well as the duration and time of the interruption period. The heat pump controller can be configured accordingly by means of the menu "Settings – Suppl. heat source – Type Util. comp. off-period".

If the requirements for bivalence setting changeover, as described in 5.4.1, are fulfilled, the supplementary heat source may also cut in in bivalence setting 3.

If the setting UC3 is selected in the menu "Settings – Suppl. heat source – Util. comp. off-period", the switching behaviour of the heat pump controller above the set limit temperature UC3 corresponds to that for UC1 and below the limit temperature to that for UC2.

Regardless of the set limit temperatures, a demand for the supplementary heat source will always occur if the heat pump is locked out on account of a malfunction (**fault**) and a heating demand exists.

#### Note:

##### **Bivalence setting B3**

Performance setting B3 is only active if also the outside temperature is below the set limit temperature for at least 60 minutes. The associated setting is to be made in the menu "Settings – Suppl. heat source – Limit value".

### 5.4.3 Activation of supplementary heat source

#### 5.4.3.1 Self-regulating supplementary heat source (variable)

Setting in the menu Settings – Suppl. heat source: Operating mode: **variable**

The heating water temperature is regulated in accordance with the heat demand, by switching

the boiler on and off. The mixer valve for the supplementary heat source is fully open and acts purely as a valve or switch. There is no Special Program available, i.e. the boiler is demand-controlled.

#### 5.4.3.2 Mixer control for supplementary heat source (constant)

Setting in the menu Settings – Suppl. heat source: Operating mode: **constant**

The boiler is enabled and voltage is applied. The burner kicks on and off in accordance with the boiler thermostat; the boiler is thus maintained at a **constant** temperature. Control is effected by the mixer cycling on and off. The mixer for the supplementary heat source is opened when there is a call for heat and closed when a lower

temperature level is requested. During water heating and swimming pool heating, the mixer valve is always fully open and after termination, i.e. half of the mixer operating time, it is moved to the "CLOSED" position, i.e. the mixer mid-position in order to assume an optimum control position for the heating mode. The mixer operating time is to be set in the menu "Settings – Suppl. heat source – Mixer runtime" according to the mixer used.

### 5.4.3.3 Activation of electric heating elements

In single energy installations, electric supplementary heating is utilised which is switched on and off in accordance with the heat demand. Special coding is to be provided in the Pre-

configuration menu by setting the "Single energy" operating mode. During a UC1 interruption, the heating elements are always switched off.

### 5.4.3.4 Special program for older systems

If there is a call for the supplementary heat source and the so-called **Special program** is activated in the menu Settings – Suppl. heat source, then the supplementary heat source continues to operate for at least 30 hours. If the heat demand decreases during this period, the supplementary heat source will enter the "Stand-by" mode (voltage is applied to suppl. heat source, but mixer is CLOSED). The supplemen-

tary heat source will not be completely switched off until no request for it exists for 30 hours.

This function can be used in bivalent systems as follows:

1. With older oil or gas boilers in order to prevent corrosion damage if the temperature frequently drops below the dew point.
2. In central storage systems to ensure adequate storage temperatures for the following day regardless of the current heat demand.

## 5.5 Switching cycle lockout and time delays

In accordance with utility company (UC) regulations (*Technische Anschlussbedingungen, TAB*), compressors of a heat pump may be switched on only three times per hour, i.e. once every 20 minutes. If a compressor was operated for more than 20 minutes, it may – after it was switched off – already be restarted after a minimum time

delay of 3 minutes. The minimum time delay is necessary to bring about a pressure compensation in the refrigeration cycle.

After power-up and UC interruption, a start-up delay period (utility company requirement) of max. 200 seconds begins.

## 5.6 Activation of circulating pumps

By activating one of the circulating pumps you determine where the heat produced by the heat pump is to be transferred. If the installation has been completed to maximum capacity, one hot water, two heating, one swimming pool water and one auxiliary circulating pump can be acti-

vated.

In heat pumps for heating and cooling, additional circulating pumps are driven by the cooling controller (see Chapter 1)

### 5.6.1 Heating circulating pump

The heating circulating pump can be operated in two different modes, which can be set in the "Settings" menu.

Heat pump optimisation is set to "No": The heating circulating pump operates continuously, except in the water heating and swimming pool heating as well as the "Summer" modes.

Heat pump optimisation is set to "Yes": In this case the heating circulating pump operates after power-up and will complete a 30-minute run-down cycle after the heat pump has been switched off.

If the heating circulating pump was switched off for more than 40 minutes, or if the return temperature has dropped below the setpoint, it will be activated for 7 minutes in order for the return sensor to recapture the temperature representative of the heating cycle (purge time).

Regardless of the setting, the heating circulating pump always operates in the heating and defrost modes as well as when there is a danger of freezing. In systems featuring two heating circuits, the 2<sup>nd</sup> heating circulating pump has the same function.

If a switchover from the heating mode to the water heating or pool heating mode occurs, the heating circulating pump will complete a run-down cycle lasting at least 1 minute.

The heating pump operates continuously at outside temperatures below 3°C, return temperatures below 15°C, and flow temperatures below 6°C (only air).

In the Summer mode, the pump is operated every 150 hours for one minute (to prevent seizure of components in the heating pump at the start of the heating season).

### 5.6.2 Hot water circulating pump

The hot water circulating pump operates during water heating. If a call for hot water occurs during the heating operation, the heating circulating pump is deactivated with the heating pump running, and the hot water circulating pump is activated.

The water heating process may be interrupted by a defrost activity or the high-pressure safety program.

If appropriately configured, i.e. menu item "Settings – Parallel heating – DHW", the hot water pump operates during the heating operation in parallel to the heating pump, until the set maximum temperature is reached.

### 5.6.3 Swimming pool circulating pump

The swimming pool water pump operates during swimming pool heating. Any ongoing pool heating operation can be interrupted at any time by a call for domestic hot water, a defrost procedure or when raising the heating curve (e.g. following a night setback), but not by a "more" heat signal from the heating controller. If the demand still exists after a 60-minute pool heating period, the swimming pool circulating pump will be auto-

matically switched off for 7 minutes. During this period, the heating circulating pump will be switched on, in order to allow the return sensor, which is mounted in the common return pipe, to recapture the temperature representative of the heating circuit. If a "more" signal is generated by the heating controller during this 7-minute period, the heating circuit will then be supplied with heat first.

### 5.6.4 Auxiliary circulating pump

The 'auxiliary circulating pump' output can be configured so that the auxiliary circulating pump can be operated in parallel with the compressor of the heat pump. It can be configured to operate after space heating, water heating and swimming pool heating. The pump will also run whe-

whenever the return temperature has dropped below 15 °C. In the Summer mode, the auxiliary circulating pump runs every 150 hours for one minute.

### 5.6.5 Primary pump for heat source

Air-to-water HP: fan  
Brine-to-water HP: brine circulating pump  
Water-to-water HP: well pump

The well water or brine circulating pump is always activated when the heat pump is activated.

It is started up one minute before the compressor starts and switches off one minute after the compressor.

With air-to-water heat pumps, the fan is additionally switched off in the defrost mode.

## 5.7 Safety functions

#### Caution!

To guarantee the frost protection function, the heat pump controller must not be disconnected from the power source and a water flow through the heat pump must be maintained.

### 5.7.1 Resetting of faults

The heat pump controller displays any existing malfunctions in plain text and the (ESC) key flashes red in addition. The heat pump is deactivated. The supplementary heat source is activated and covers the entire heat demand (this

does not apply to monovalent systems. After the malfunction has been eliminated, the heat pump can be started up again by pressing the (ESC) key. (Switching off the control voltage causes the existing fault to be reset as well.)

### 5.7.2 Sensor Break

The controller monitors the temperature sensor. In the event that a sensor is not connected, or if a short-circuit or a break in a sensor line has

occurred, the heating mode is activated to prevent the system from freezing up.

### 5.7.3 Frost protection

If the outside temperature drops below 3°C and pump optimisation is activated, the heating circulating pump is started in order to reliably prevent freezing up. If the heating water temperature in the return pipe drops below 15°C ±1K,

then the heating and auxiliary circulating pumps are switched on as well.

In the case of air-to-water heat pumps, the heating and auxiliary circulating pumps are activated when the heating water flow temperature is below 6°C..

## 6 Special Functions

### 6.1 Commissioning (of air-to-water heat pumps)

Immediately after the activation of the Commissioning function, any defrost activity is suppressed for one hour, any ongoing defrost process is immediately aborted.

The supplementary heat source is enabled for as long as this function is activated.

The heating pump operates continuously during Commissioning (no optimisation possible).

Any possible call for hot water or swimming pool heating is ignored.

### 6.2 Initial heating program (screed drying)

Initial heating of the screed takes place according to established schedules (standard or directives).

The data and procedures described here are, however, adapted to suit the requirements of a heat pump controller.

The individual programs are activated in the menu (menu item SPECIAL FUNCTIONS); the maximum temperature is set here as well.

As a rule, two program types are available for selection:

#### 6.2.1 Underfloor heating functional check according to DIN EN 1264-4

This program is considered to be a functional check for underfloor heating systems and it is performed following the normal screed drying time and after the screed heating operation designed to prepare the screed for floor covering. It is used to detect any defects in the screed and the underfloor heating system that may exist.

Step 1: A constant return temperature of 20°C is to be maintained for 72 hours (3 days).

Step 2: The maximum return temperature (adjustable) is to be maintained for 96 hours (4 days).

Step 3: The heat pump is to remain deactivated until the return temperature has dropped to below 20°C.

The time period required for step 3 is limited to a maximum of 72 hours since at high outside temperatures the return temperature may possibly not fall below 20°C.

Following the UFH functional check, the heat pump will return to normal operation (as preset and configured).

#### Caution!

The UFH functional check should not take place until after normal screed drying or after screed heating designed to prepare the screed for floor covering has been performed.

## 6.2.2 Heating for screed drying and floor covering preparation

### 6.2.2.1 General

To be performed according to specialist information of various associations and institutes!

This program is designed to remove the moisture from the screed to such an extent that floor coverings can be laid.

It is, however, imperative that the moisture content be measured, as additional drying may be necessary (can be accomplished by means of fixed-setpoint control).

The directive provides for a fixed number of steps with specified time periods. This sequence

can be selected in the menu HEAT./SCREED DRYING STANDARD PROGRAM.

As a rule, the standard program should be used, in agreement with the person laying the screed. Only in the case of special demands on the preheating operation may it be necessary to individually adapt the process predetermined for the standard program. To this end, select the menu item HEAT./SCREED DRYING INDIVIDUAL PROGRAM.

### 6.2.2.2 Heating (screed) as preparation for floor covering – Standard program

This program comprises 8 steps and is, as a rule, suitable for all underfloor heating systems. Before it is activated, the maximum permissible return temperature, e.g. 32°C, needs to be entered.

- Steps 1-4: preheating procedures
- Step 5: maintaining temperature
- Steps 6-8: heat reduction procedures

Steps 1 through 4 are initial heating procedures with a duration of 24 hours each. The return setpoint temperature is increased with each step from 20°C up to the maximum return temperature.

To terminate a program step, two conditions must be met: The associated setpoint temperature must be reached or exceeded, and the time period of 24 hours must have expired. Should the temperature be reached before the 24 hour-period has elapsed, then the heat pump attempts to maintain the associated setpoint temperature during the remainder of the time. No analysis will, however, be made as to how long this temperature was actually reached.

In step 5, the maximum return temperature is to be maintained for a time period of 264 hours. Here, a total of the time during which the maximum return temperature was actually reached, will be calculated. The upper limit is undefined, the lower limit is the setpoint - hysteresis.

Only when the total time reaches the value of 264 hours will this program step be terminated.

Steps 6 through 8 are heat-reduction steps with a duration of 24 hours each. The return setpoint temperature is reduced with each step, from the maximum return temperature down to 20°C.

To terminate a program step, two conditions must be met: The associated setpoint temperature must be fallen short of, and the time period of 24 hours must have expired. Should the temperature be fallen short of before the 24-hour period has elapsed, then the heat pump attempts to maintain the associated setpoint temperature during the remainder of the time. No analysis will, however, be made as to how long this temperature was actually reached.

The duration of the heat-reduction procedures is limited to max. 72 hours, as at high outside temperatures the requested return temperature may possibly not be fallen short of.

Following the heating for screed drying and floor covering preparation, the heat pump automatically returns to normal operation.

Example:

Max. return temperature 32°C

- Steps 1-4: 20 / 24 / 28 / 32°C
- Step 5: 32°C to be maintained
- Steps 6-8: 28 / 24 / 20 °C

### 6.2.2.3 Heating (screed) as preparation for floor covering – Individual program

This program provides the following settings:

- Heat-up temp.diff.:  
Starting from an initial temperature of 20°C, the setpoint temperature is increased with each program step by the preset difference up to the set maximum temperature.  
The number of steps is thus a result of these factors.

- Heating-up period:  
Here, the number of hours can be entered in which the relevant setpoint temperature must be reached and should be maintained (function as described above).
- Temp. maint. period:  
Here, the number of hours can be entered over which the maximum setpoint temperature must be maintained.

- Heat-reduct. temp. diff.:  
Starting with the preset maximum temperature, the setpoint temperature is lowered with each program step by the preset difference down to the initial value of 20 °C.  
The number of steps is thus a result of these factors.

### 6.2.3 Implementation of the guideline for heat pump heating systems

The guideline is based on whole days for which a predetermined temperature is to be reached or maintained.

If the screed has a high moisture content, the predetermined temperatures are frequently not reached within the specified time period. For adequate screed drying results it is, however, imperative that the particular temperature level be maintained for a given time period.

Therefore, the days as described in the standard are converted into program steps with one program step corresponding to the combination of the number of days or hours and the associated temperature.

For the total initial heating program time only one value with respect to the minimum number of days can be entered. The actual duration is system-dependent and cannot be precisely determined beforehand.

The overall duration of all heat-reduction processes is limited to maximum of 72 hours (or 120 hours in the case of the Individual program).

The usual standards and guidelines always describe the flow temperature of the heating system. For the control of the heat pump, however, the return temperature is the decisive factor.

Note:

In the menu of the heat pump controller, the max. return temperature must be entered. It results from the max. flow temperature minus the temperature difference (e.g. 7 K).

The menu allows you to configure whether a demand for hot water generation or pool heating can be satisfied during this heating program.

If no call for hot water or pool heating is desired, those demands as well as the pumps will be locked out accordingly.

If these demands are allowed to be satisfied, then they will be processed in accordance with the usual priorities (the preheating program may last longer, under certain circumstances).

During preheating the following applies:

- the heating pumps for heating circuits 1 and 2 are operating continuously
- any programmed temperature lowering or raising times will be ignored
- a fixed hysteresis of  $\pm 0.5$  K (regardless of the configuration in the menu) applies

- Heat reduction period:  
Here, the number of hours can be entered in which the relevant setpoint temperature must be reached and should be maintained.

In all other respect, the same applies as described under HEATING AS PREPARATION FOR FLOOR COVERING – STANDARD PROGRAM.

- the limit temperature for the supplementary heat source is fixed at +20 °C (regardless of the configuration in the menu)
- the calculated setpoint temperature applies to both heating circuits
- the mixer valve of heating circuit 2 is activated by 'contin. OPEN'

Two options are available to terminate the program:

1. Via the menu by changing a program from Yes → No. On restarting, the program will start with step 1.
2. Brief interruption the supply voltage during an ongoing preheating program. On restarting, the program step that was active before will be resumed.

In the case of a malfunction, the program will stop at the particular point. After eliminating and resetting the fault, the respective program step will be continued.

The same applies to regular off-periods (e.g. service interruption by utility company).

The controller documents the data of the most recent completely executed initial heating program (HISTORY)

- Screen 1: Date start  
UFH funct. check  
Date end UFH funct. check
- Screen 2: Date start Heat./Screed drying  
Date end Heat./Screed drying

## 7 Extended Functional Description of Heat Pump Controller (Manager) for Heating / Cooling

### 7.1 Controller design

Two types of cooling systems are supported:

- Active cooling using a reversible heat pump
- Passive cooling via a heat exchanger

To be able to perform the cooling function, a Cooling controller must be available in addition to the Heating heat pump controller.

- For active cooling, the reversible heat pumps are factory-supplied with a heat pump controller for heating/cooling.
- For passive cooling, it is necessary that the Cooling controller be connected to the existing Heating heat pump controller.

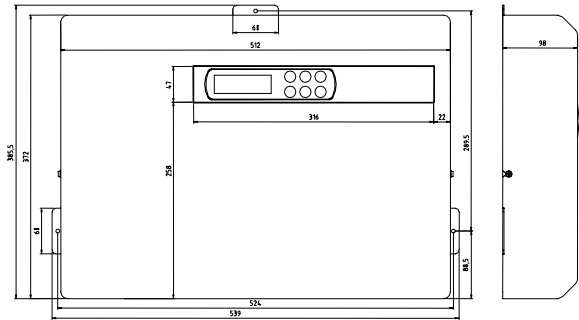


Fig. 7.1: Dimensions of heat pump controller WPM 2004 R

#### 7.1.1 Network operation of heating and cooling controller and remote control station

The two controllers (heating and cooling controllers) are connected to the J11 connectors using a three-core connecting cable and are operated as a network. The network addresses of heating and cooling controllers are preset.

A major prerequisite for the correct network operation is that the softwares of the heating and cooling controllers are compatible.

Heating software    WPM\_H\_ **X** **Y** ...  
Cooling software    WPM\_K\_ **X** **Y** ...

The software is compatible if the letters **X** and **Y** are identical, e.g.

WPM\_K\_ **H4**1 compatible with WPM\_H\_ **H4**5  
WPM\_K\_ **H4**1 not compatible with WPM\_H\_ **H3**1

A remote control station that may be connected must be set as shown in Fig. 7.1.b

In the "Operating data - Network" menu you can check whether a cooling controller has been detected by the system. Whether the network connection is active is indicated under "Network heat / cool".

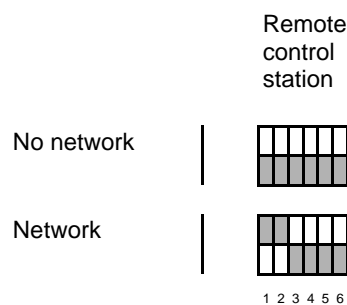


Fig. 7.1.b: Setting of DIP switches

#### 7.1.2 Temp. sensor (cooling contr.)

All temperature sensors to be connected to the additional cooling controller are in accordance with the sensor diagram displayed.

Depending on the heat pump type, the following temperature sensors are already integrated or need to be mounted in addition:

- Room temperature sensor, room climate control station (see 2.2.2.1)
- Flow and return temperature sensors, passive cooling station (see 2.2.2.2)

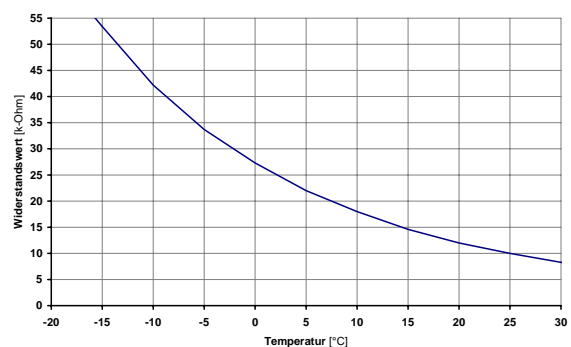


Fig. 7.2: NTC sensor cooling controller

## 7.2 Cooling

### 7.2.1 Activation of the cooling mode

The cooling functions are to be manually activated as the 6<sup>th</sup> operating mode; no automatic switchover between heating and cooling mode takes place.

The Cooling operating mode can only be activated if the cooling function (active or passive) was enabled in Pre-configuration.

### 7.2.2 Activation of the cooling functions

With activation of the cooling mode, special control functions are performed. These cooling functions are taken over by the additional controller, separate from the other control functions.

Activation of the cooling function can be prevented due to the following reasons:

- The outside temperature is below 15°C (reversible Air HP)

- No cooling controller is available or the connection is faulty
- Neither silent nor dynamic cooling was chosen in Settings by selecting "YES"

In this state, the Cooling mode remains active, the control, however, behaves just like in the Summer mode.

### 7.2.3 Silent and dynamic cooling

Various system configurations can be realised, depending on the integration scheme:

- Dynamic cooling only (e.g. using fan convectors)

The control is of the fixed-setpoint type. In the Settings menu option, set the desired return flow temperature.

- Silent cooling only (e.g. underfloor, wall or ceiling cooling)

The control is governed by the room temperature. The decisive factor is the temperature of the room in which the room climate control station is installed as shown in the connection diagram. In the Settings menu option, set the desired room temperature.

- Combination of dynamic and silent cooling

Control is effected based on two separate control circuits.

The control for the dynamic cooling mode is a fixed-setpoint control (as described under active cooling).

The control for the silent cooling mode is based on the room temperature (as described under silent cooling) by activation of the mixer valve of heating circuit 2 (silent heating / cooling circuit).

The selection is to be made in the "Settings – Cooling" menu option.

### 7.2.4 Heating circulating pump of heating circuit 1

The heating circulating pump of heating circuit 1 is always operating when the heating circulating pump is operating, with the exception of the

cooling mode if heating circuit 2 and solely silent cooling was configured.

### 7.2.5 Heating circulating pump of heating circuit 2

The heating circulating pump of heating circuit 2 is always operating when the heating circulating pump of heating circuit 1 is operating, with

the exception of the cooling mode if heating circuit 2 and solely dynamic cooling was configured.

### 7.2.6 Safety functions (displayed on controller)

As a safety feature, the following limits exist:

- The flow temperature falls below the value of 7°C

- Tripping of the dew point monitor at sensitive points of the cooling system
- The dew point was reached

## 7.3 Functional description of active cooling

Active cold generation is effected in the refrigeration circuit of the heat pump. The demands are processed according to the following priority ranking.

- Cooling has priority over
- Hot water which has priority over
- Swimming pool

The waste heat generated in the cooling mode can be used for hot water generation or pool heating. To this end, the Max. temp. Parallel heating – DHW is to be set in the "Settings – Hot water" menu item. The hot water pump is operating in the cooling mode for as long as the hot water temperature is below this limit. After this limit has been reached, the hot water pump is switched off and the swimming pool pump is

switched off and the swimming pool pump is switched on (regardless of the input of the swimming pool thermostat). A prerequisite for this is that an auxiliary heat exchanger is integrated in the heat pump and set to "YES" in the Heat exchanger menu item.

If no cooling demand exists, calls for hot water or swimming pool heating can be processed. These functions are, however, aborted after a continuous operating time of max. 20 minutes if an existing call for cooling needs to be processed as a matter of priority.

During hot water generation or swimming pool heating, the heat pump is operating just like in the heating mode.

## 7.4 Functional description of passive cooling station

Cold production is effected by switching the Cooling primary pump (M12) on and off. The compressor of the heat pump is not active and is therefore available for hot water generation. The parallel operation of cooling and hot water generation is to be activated in the settings of the heat pump controller.

Setting Parallel cooling-DHW: Yes

### Note:

For the parallel operation of cooling and water heating, special requirements concerning the hydraulic connection must be complied with (refer to the Project Planning documents).

If no parallel operation is activated on the heat pump controller, the demands are processed in accordance with the following priorities:

- Hot water has priority over
- Cooling which has priority over
- Swimming pool

In the following cases, the Cooling primary pump (M12) is switched off for safety reasons:

- The flow temperature has fallen below a value of 7°C
- Tripping of the dew point monitor at sensitive points of the cooling system

The cooling circulating pump (M17) is operating continuously in the Cooling mode.

### Jumper wire A5/ID8 in place:

Cooling via cooling circulating pump (M17), heating circulating pump of the principal circuit (M13) remains off in the cooling mode.

### Removal of jumper wire A5/ID8

The heating circulating pump of the principal circuit (M13) takes over the distribution in the heating and cooling modes.

## 7.5 Functional description of wall-mounted cooling controller

Cold production is effected by switching the primary pump M11 (e.g. well pump) or an auxiliary Cooling primary pump (M12) on and off. The

cycling behaviour of the primary pump is modified by placing a jumper wire A6 across input ID7.

### 7.5.1 Cycling behaviour of primary pump

#### Placing jumper wire A6/ID7

If there is a cooling demand, primary pump M11 is activated, i.e. the same primary pump is used in the heating and cooling mode (e.g. well pump in the case of water-to-water heat pumps)

#### Removal of jumper wire A6/ID7

In the case of a cooling demand, an auxiliary Cooling primary pump (M12) can be connected to output NO6. The output 'primary circulating pump M11' is only active in the heating mode.

### 7.5.2 Circulating pump for cooling (cold distribution)

The cooling system may be operated both via the existing heating circulating pump (combined heating/cooling system) and via an additional cooling circulating pump.

In the as-delivered state, the existing heating circulating pump is also used in the cooling mode (*integration schemes 3 and 4*). If an additional cooling pump (e.g. in a four-pipe system)

is used, heating circulating pump must be deactivated in the cooling mode. This is effected by

placing a jumper wire A5 between X2 (+VDC) and ID8 (see also 7.4).

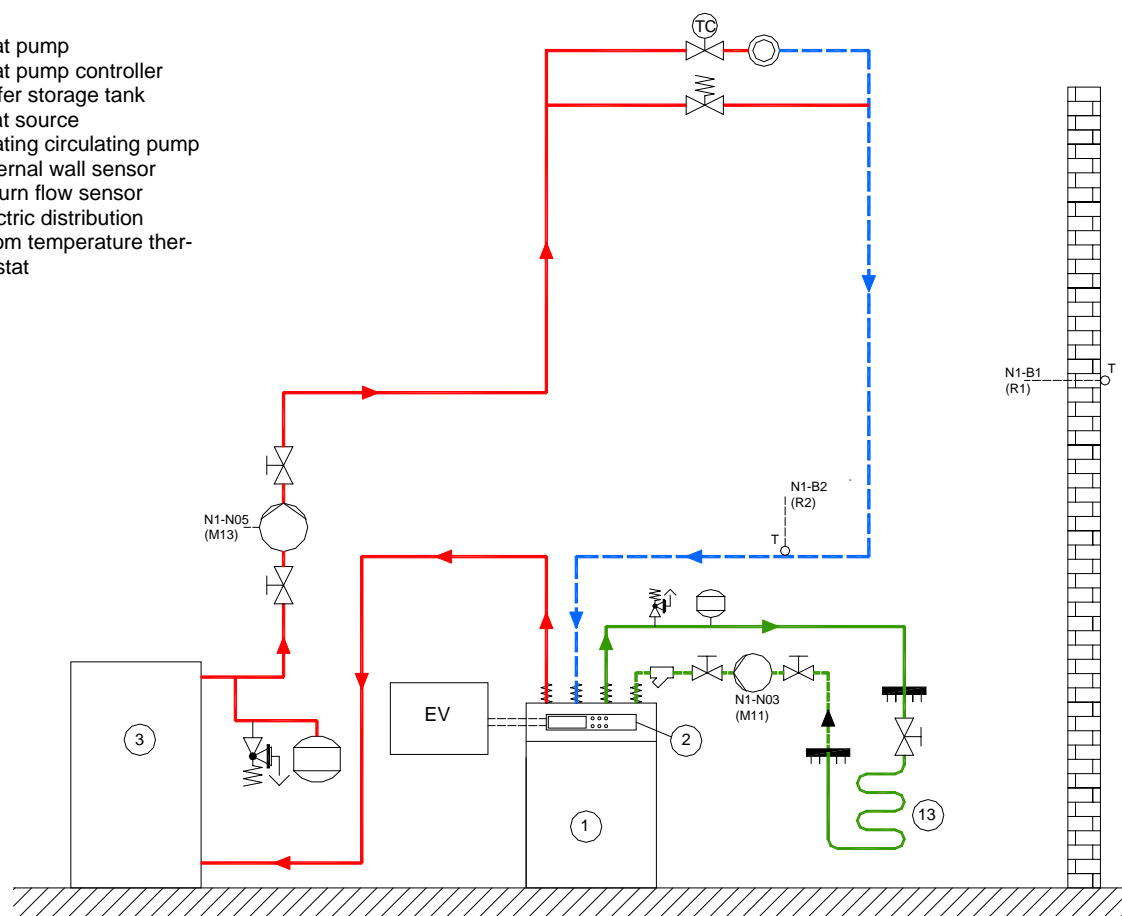
## 8 Technical Equipment Information

Mains voltage		230 V AC 50 Hz
Voltage range		195 to 253 V AC
Power consumption		approx. 50 VA
Enclosure type acc. to EN 60529 Enclosure type acc. to EN 60730		IP 20
Switching capacity of outputs		max. 2 A (2 A) $\cos(\varphi) = 0,4$ at 230 V
Operating temperature		0 °C - 35 °C
Storage temperature		-15 °C +60 °C
Weight		4 100 g

## 9 Integration Examples

### 9.1 Heat pump system for heating purposes

- 1.1 Heat pump
- 2 Heat pump controller
- 3 Buffer storage tank
- 13 Heat source
- M13 Heating circulating pump
- R1 External wall sensor
- R2 Return flow sensor
- EV Electric distribution
- TC Room temperature thermostat



**Fig. 9.1:** Plumbing schematic for monovalent heat pump operation with a single heating circuit

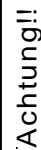
- air-to-water heat pump  
 heat pump controller  
 buffer storage tank  
 hot water tank  
 electric heating element  
 immersion heater  
 hot water  
 heating circulating  
 pump principal circuit /  
 heating circuit 1  
 heating circulating  
 pump heating circuit 2
- 
- The diagram illustrates a complex heating system architecture. At the top left, a legend identifies the components: air-to-water heat pump, heat pump controller, buffer storage tank, hot water tank, electric heating element, immersion heater, hot water, heating circulating pump principal circuit / heating circuit 1, heating circulating pump heating circuit 2. The system is divided into two main circulation loops: a red loop for the principal circuit and a blue loop for heating circuit 2. The red loop starts from a buffer tank (1.1) at the bottom, passes through a pump (N1-N06/M18), a valve, and a heat exchanger (N1-N04/E10) with an electric valve (N1-N04/E10) and sensor (N1-N04/R2). It then goes through a pump (N1-N05/M13) and a valve to a heat exchanger (N1-N05/M13) with an electric valve (N1-N05/E9) and sensor (N1-N05/R3). The blue loop starts from the buffer tank (1.1), passes through a valve, a pump (N1-N012/N013/M22), and a valve to a heat exchanger (N1-N011/M15) with a sensor (N1-N011/R5). It then goes through a pump (N1-N05/M13) and a valve to a heat exchanger (N1-N05/M13) with a sensor (N1-N05/R3). The system also includes a hot water tank (1.2) with an electric heating element (N1-N010/E9) and a sensor (N1-N010/R3). A hot water tank (1.1) is also shown with a sensor (N1-N01/R1). The system is controlled by a heat pump controller (EV) and a heat pump (1.1).

## 9.2 Heating/cooling heat pump system

- 1.1 Reversible air-to-water heat pump  
 2 Heat pump controller  
 3 Hot water storage tank  
 4 Swimming pool heat exchanger  
 5 Buffer tank  
 6 Hot water tank

50

## 10.1 Heat pump controller for heating



**Fig. 10.1:** Connection diagram of the wall-mounted WPM 2004plus heat pump controller (manager)

## 10.2 Key to the circuit diagram of the heat pump controller for heating

- A1 Jumper wire EVS (J5/ID3-EVS to X2) must be fitted if no UC disable contactor is available (contact open = utility company lock-out).
- A2 Jumper wire SPR (J5-ID4 to X2, is dispensed with if input is wired. Function is selectable
- A3 Jumper wire (fault M11 ). In lieu of A3 a pot.-free NC contact can be used. e.g. motor protection switch
- A4 Jumper wire (fault M1). In lieu of A4 a pot.-free NC contact can be used. e.g. motor protection switch
- B2\* Pressostat low-pressure brine
- B3\* Thermostat hot water
- B4\* Thermostat swimming pool water
- E9 Electr. immersion heater for hot water
- E10\* Suppl. heat source (boiler or electr. heating element)
- F1 Control-circuit fuse N1 5x20 / 2.0A T
- F2 Load fuse for clamp-type terminals J12 and J13 5x20/ 4.0ATr
- F3 Load fuse for clamp-type terminals J15 to J18 5x20 / 4.0ATr
- H5\* Signal lamp of remote fault indicator

### Caution!

24 V extra-low voltage is applied to clamp-type terminals J1 to J7 and connectors X2/X3 and X8.

On no account must any higher voltage be applied.

- J1 Terminal for power supply of controller unit (24VAC / 50Hz)
- J2 Terminal for hot water, return and external sensors
- J3 Input for HP coding and frost protection sensor via control wire of connector X8
- J4 Output 0-10VDC for activation of remote fault indicator and swimming pool circulating pump
- J5 Terminal for hot water thermostat, swimming pool thermostat and utility comp. (UC) disable functions
- J6 Terminal for sensor of heating circuit 2
- J7 Terminal for alarm message "low pressure, brine"
- J8 Inputs, outputs 230VAC for control of HP control lead connector X11
- J9 Outlet not used as yet
- J10 Outlet for connection of remote control (6-pole)
- J11 Terminal not used yet

### Caution!

The furnished replacement fuses may only be used in place of fuses F2 and F3 shown in the connection diagram.

### Connection of external system components

#### Inputs

Terminal	Explanation
J2-B1 X3	External sensor
J2-B2 X3	Return sensor
J2-B3 X3	Hot water sensor
J5-ID1 X2	Hot water thermostat
J5-ID2 X2	Swimming pool thermostat
J5-ID3 X2	Util. comp. disable
J5-ID4 X2	External disable contact
J5-ID5 X2	Fault primary pump / fan
J5-ID6 X2	Fault compressor
J6-B6 J6-GND	Return sensor heating circuit 2
J7-ID9 X2	Low pressure, brine

- J12 to J18 230V AC outputs for activation of the system components (pump, mixer, heating element, boiler)
- K9 Coupling relay 230V/24V
- K11\* Electron. relay for remote fault indicator
- K12\* Electron. relay for swimming pool circulating pump
- K20\* Contactor suppl. heat source
- K21\* Contactor electr. immersion heater for hot water
- K22\* Util. comp. disable contactor (UCD)
- K23\* Auxiliary relay for SPR
- M11\* Primary pump
- M13\* Heating circulating pump
- M15\* Heating circulating pump, heating circuit 2
- M16\* Auxiliary circulating pump
- M18\* Hot water circulating pump
- M19\* Swimming pool circulating pump
- M21\* Mixer of principal circuit
- M22\* Mixer of heating circuit 2
- N1 Controller unit
- N10 Remote control station
- N11 Relay assembly
- R1 External wall sensor
- R2 Return flow sensor
- R3 Hot water sensor
- R5 Return sensor of heating circuit 2
- R9 Flow sensor (frost protection)
- T1 Safety transformer 230 / 24 V AC / 28VA
- X1 Terminal strip, mains connection, N and PE distr.
- X2 Terminal 24VAC
- X3 Terminal, Ground
- X8 Connector, control line (extra-low voltage)
- X11 Connector, control line 230VAC

#### Abbreviations:

MA Mixer "OPEN"

MZ Mixer "CLOSED"

\*) Components to be supplied by customer

#### Outputs

Terminal	Explanation
J12-NO3 N / PE	Primary pump / fan
J13-NO4 N / PE	Suppl. heat source
J13-NO5 N / PE	Heating circulating pump
J13-NO6 N / PE	Hot water circulating pump
J14-NO7 N / PE	Mixer Open heating circuit 1
J15-NO8 N / PE	Mixer Closed heating circuit 1
J16-NO9 N / PE	Auxiliary circulating pump
J16-NO10 N / PE	Immersion heater, hot water
J16-NO11 N / PE	Heating circulating pump, heat. circ 2
J17-NO12 N / PE	Mixer Open heating circuit 2
J18-NO13 N / PE	Mixer Closed heating circuit 2
J4-Y2 X1	Remote fault indicator
J4-Y3 X1	Swimming pool circulating pump

### Relay assembly:

The connection of remote fault indicator and swimming pool pump is accomplished in the case of WPM 2004 plus by means of relay assembly RBG WPM that is available as a special accessory.

## 10.3 Heat pump controller for heating and cooling

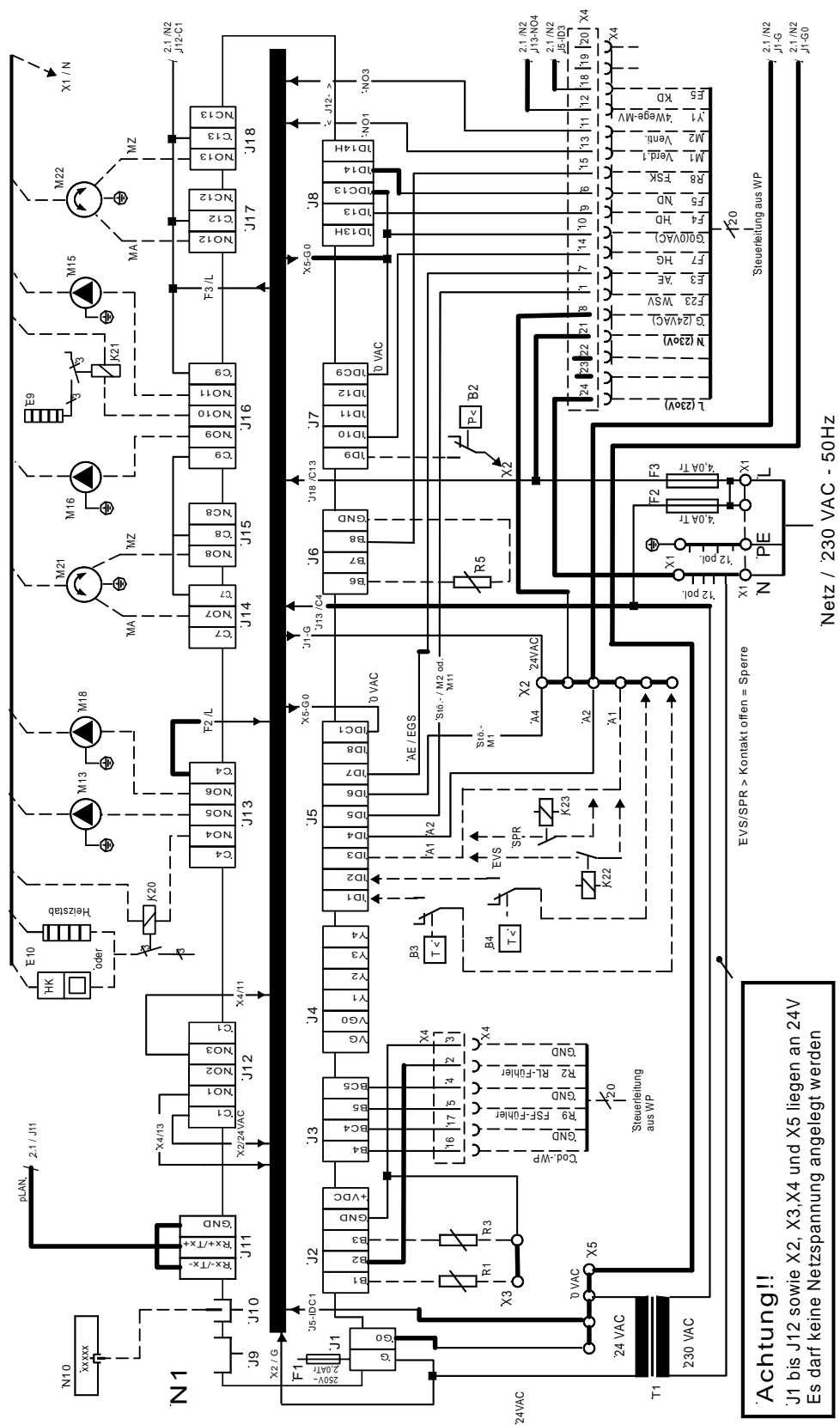


Fig. 10.2: Connection diagram of the wall-mounted WPM 2004 R – N1 heat pump controller

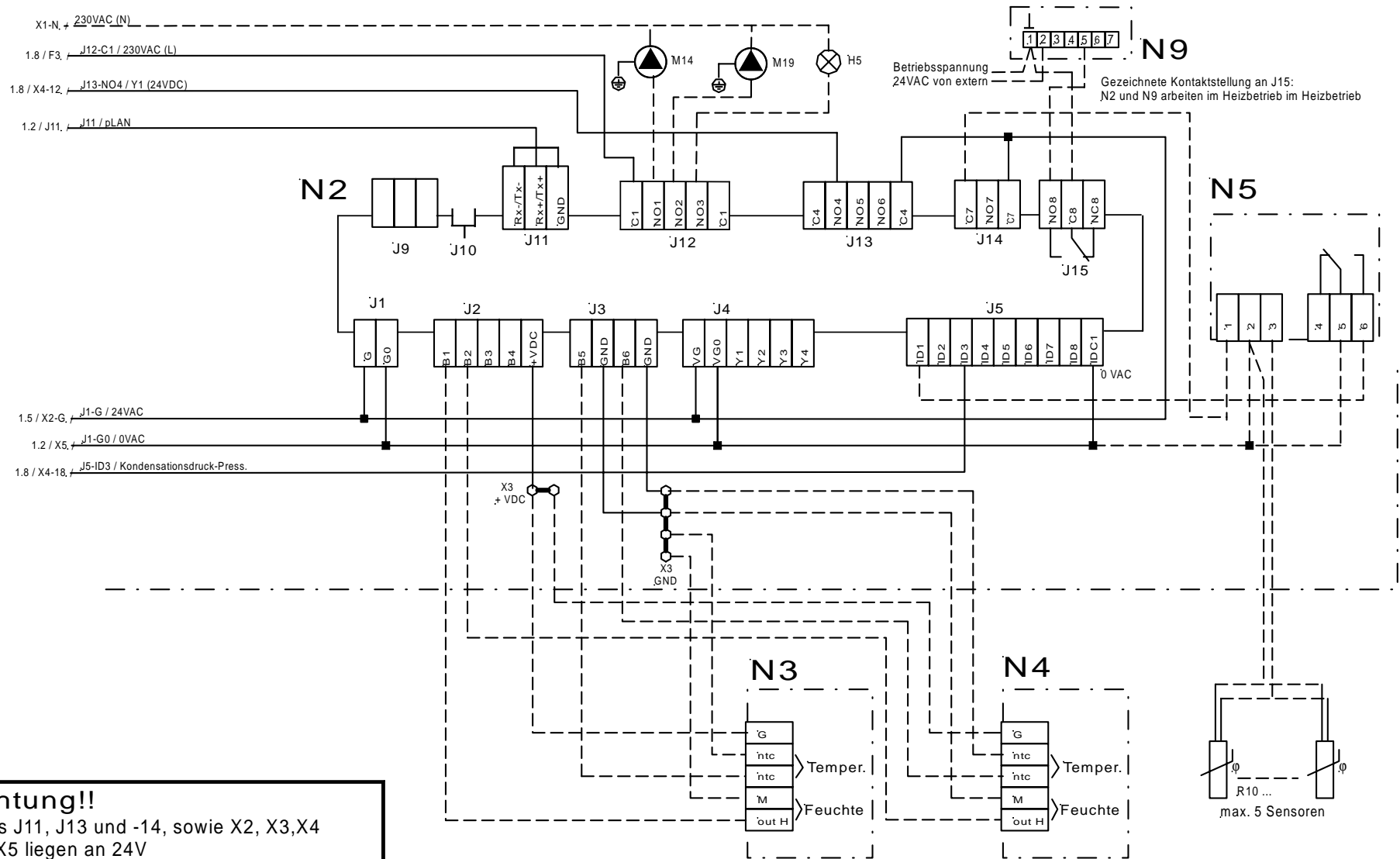


Fig. 10.3: Connection diagram of the wall-mounted WPM 2004 R – N2 heat pump controller

## 10.4 Key to the circuit diagram of the heat pump controller for Heating/Cooling

- A1 Jumper wire EVS (utility company disable input) must be fitted if UC disable contactor is missing (jumper open = HP off)
- A2 Jumper wire SPR (disable input, configurable)
- A4 Jumper wire (compressor fault)
- B2\* Pressostat low-pressure brine
- B3\* Thermostat hot water
- B4\* Thermostat swimming pool water
- E9\* Electr. immersion heater, hot water
- E10\* Suppl. heat source (boiler or electr. heating element)
- F1 Control circuit fuse, standard controller
- F2 Load fuse for clamp-type terminals J12 and J13 (N1) / J12 (N2) / transf. 5x20/4.0A T
- F3 Load fuse for clamp-type terminals J15 to J18 5x20/4.0A T
- H5\* Signal lamp of remote fault indicator

### Clamp-type terminals N1 (heating controller)

- J1 Terminal for power supply of controller unit (24VAC / 50Hz)
- J2 Terminal for sensors R1, R2, R3
- J3 Input for R7 and R9 via control circuit line connector X4
- J4 Analog outputs are not used yet
- J5 Terminal for hot water thermostat, swimming pool thermostat and utility comp. (UC) disable functions
- J6 Terminal for sensors R5, R8
- J7 Terminal for alarm message "low-pressure, brine"
- J8 Inputs, outputs 24VAC for control of HP
- J9 Outlet not used yet
- J10 Outlet (6-pole) for connection of N10
- J11 Terminal for pLAN
- J12 Outputs for compressor and fan
- J13 to J18 230VAC – outputs for activation of system components (pumps, mixer, immersion heater, suppl. heat source)

### Clamp-type terminals N2 (cooling controller)

- J1 Terminal for power supply of controller unit (24VAC / 50Hz)
- J2 Analog inputs for humidity sensors of room control modules N3/N4
- J3 Analog inputs for temperature sensors of room control modules N3/N4
- J4 Analog outputs are not used yet
- J5 Digital input (24VAC/DC) condensation pressure pressostat
- J9 Outlet not used yet
- J10 Outlet not used yet
- J11 Terminal for pLAN
- J12 Outputs (230VAC) for M14, M19, H5
- J13 Output 4-way reversing valve
- J14 Outlet is not used yet
- J15 Output (potential-free) for changeover "Heating/Cooling" of room thermostats

- K20\* Contactor suppl. heat source
- K21\* Contactor electr. immersion heater f. hot water
- K22\* Util. comp. disable contactor
- K23\* SPR auxiliary relay

- M13\* Heating circulating pump
- M14\* Heating circulating pump heating circuit 1
- M15\* Heating circulating pump heating circuit 2
- M16\* Auxiliary circulating pump
- M18\* Hot water circulating pump
- M19\* Swimming pool circulating pump

- R1 External wall sensor
- R2 Return sensor
- R3\* Hot water sensor
- R5 Return sensor heating circuit 2
- R7 Coding resistor HP
- R8 Frost protection sensor, cooling
- R9 Frost protection sensor, heating
- R10\* Humidity sensors of N5

- N1 Standard controller (pCO2)
- N2 Cooling controller (pCO1)
- N3/N4\* Room climate control stations
- N5\* Dew point monitor
- N9\* Room thermostat (switch-over)
- N10\* Remote control station
- T1 Safety transf. 230//24 VAC / 50VA
- X1 Terminal strip, mains connect., N and PE distr
- X2 Terminal 24VAC
- X3 Terminal, Ground
- X4 Connector, control line (extra-low voltage)
- X5 Terminal 0V-VAC

### Abbreviations:

- MA Mixer "OPEN"
- MZ Mixer "OPEN"

**\*) Components to be supplied by the customer or available as accessories**

# 11 Displays

Message HP	Explanation	Display	Troubleshooting, check whether
HP OFF	Heat pump is not running because no demand for heat exists.		
HP on heating	Heat pump is running in the heating mode.		
HP on cooling	Heat pump is running with cooling mode activated.	Cooling function	
HP on hot water	Heat pump is running in the water heating mode and heats the hot water storage tank.	Hot water	
HP on swim. pool	Heat pump is running and heating the swimming pool water.	Swimming pool	
HP + HS 2 htg	Heat pump and suppl. heat source are running in the heating mode.	Biv./Single energy	
HP + HS 2 swim. pool	Heat pump and suppl. heat source are running and heating the swimming pool water.	Biv./Single energy Swimming pool	
HP + HS 2 hot water	Heat pump and suppl. heat source are running in the water heating mode and are heating the hot water storage tank.	Biv./Single energy Hot water	
Minimum restart delay HP waiting	Heat pump starts after a minimum time delay has elapsed, to satisfy an existing demand for heat. The minimum restart delay protects the heat pump and may last up to 3 minutes.		* the last deactivation of a compressor was carried out less than 3 minutes ago (i.e. a minimum time delay period is in progress)
Switch. cycle lockout HP waiting	Heat pump starts after the lockout period has expired in order to satisfy a demand for heat that may exist. The lockout period is a requirement by the utility company and may last up to 20 minutes. Max. 3 activations per hour are permissible.		* the last activation of a compressor was carried out less than 20 minutes ago (i.e. lockout mode is active)
Line load HP waiting	Heat pump starts after the power-up delay has expired in order to subsequently satisfy a call for heat that may exist. The power-up delay is a requirement of the utility company following voltage recovery or a utility company lockout and may last up to 200 seconds.		* mains power was switched on * a utility company lockout has elapsed
Util. comp. shut-off HP waiting	Heat pump starts after the utility company lockout time has expired. The utility company lockout is a requirement of the utility company and lasts for up to two hours, depending on the UC. Activation and deactivation is effected by the utility company.		* a utility company lockout period is in progress
Ext. disable contact HP waiting	Heat pump was switched off by an external lockout signal at ID4.		
Prim. pump flow temp. HP waiting	Heat pump starts following the primary pump priming process which can last up to 3 minutes. (Safety function).	Brine/water or water/water HP	
Low pressure limit HP waiting	Heat pump was switched off on reaching the low pressure limit value. The heat pump restarts automatically. The suppl. heat source (HS 2) takes over the heating operation until the heat pump restarts automatically.	Air/water HP	* the evaporator is excessively iced up. * the air intake or air discharge openings are too small or obstructed. * extremely unfavourable weather conditions exist at external wall temperatures below approx. +3°C.
Low pressure cutout. HP waiting	Heat pump was switched off on reaching the low pressure limit value. The heat pump restarts automatically. The suppl. heat source (HS 2) takes over the heating operation until the heat pump restarts automatically.	Brine/water or water/water HP	* no malfunction, may occur with certain water-to-water or brine-to-water heat pumps.
Lower operat. limit HP waiting	The heat pump was switched off on reaching the lower operating limit. The heat pump restarts automatically as soon as the heat source temperature has risen to a sufficiently high value (safety function).	Brine/water or water/water HP	* the well water or brine temperature or flow rate is too low. * check strainer for cleanliness.

High-pressure prot. HP OFF	The heat pump was switched off on reaching the high pressure limit. The heat pump restarts automatically after a few minutes (high pressure safety program).		
Temperature limit HP waiting	The heat pump cannot start due to the temperature operating limit. The outside air temperature is lower than $-15^{\circ}\text{C}$ or $-20^{\circ}\text{C}$ , or in excess of $35^{\circ}\text{C}$ (safety function). Or else, the heat pump was locked out in the setting "Bivalent-Alternative" because the outside temperature is lower than the limit temperature.	Air/water HP	
HP disabled Suppl. heat source	The heat pump is switched off because the suppl. heat source operating mode (HS 2) was selected. Heating is provided by the suppl. heat source.		* the external wall temperature lies within the heat pump operating range. * the outside temperature sensor is operational.
Flowrate monitoring HP on	Before evaporator defrosting is started, the heating water flow rate is monitored. This process takes max. 4 minutes.	Air/water HP	
Defrost HP on	The heat pump performs evaporator defrosting. This process takes max. 8 minutes.	Air/water HP	
Upper operat.limit HP waiting	The maximum return temperature of $50^{\circ}\text{C}$ in the heating mode was exceeded. After the temperature has dropped, the HP restarts automatically.	Brine/water or water/water HP	
Delay Oper. mode cooling	On switchover to the Cooling mode and back, a time delay of 10 minutes is activated. The heat pump remains deactivated during this time period.	Cooling function	
Freeze protection, cold generation Cold generator waiting	The cold generator is not able to cool, although there is a call for cooling, because the frost protection function was activated. This state will be terminated automatically.	Cooling function	
Flow temp. limit Cold generator waiting	The cold generator is not able to cool, although there is a call for cooling, because the current supply temperature is below the operating limit. This state will be terminated automatically.	Cooling function	
Dew point monitor Cold generator waiting	The cold generator is not able to cool, although there is a call for cooling, because the dew point monitor was activated (external input). This state will be terminated automatically.	Cooling function	
Dew point Cold generator waiting	The cold generator is not able to cool, although there is a call for cooling, because dew point calculated from the sensor values of the room climate control station has been fallen short of. This state will be terminated automatically.	Cooling function	
Passive cooling HP off	Passive cooling is provided, no call for heat pump action exists.	Cooling function	

## 12 Special Accessories

### 12.1 Remote control station

A remote control station is available as a special accessory. Operation and menu user guidance are identical with those of the heat pump controller; additional pushbuttons allow additional functions to be used (for a more detailed description, refer to the remote control station operating manual). The connection is effected via a 6-core telephone cable (special accessory) with Western connectors.

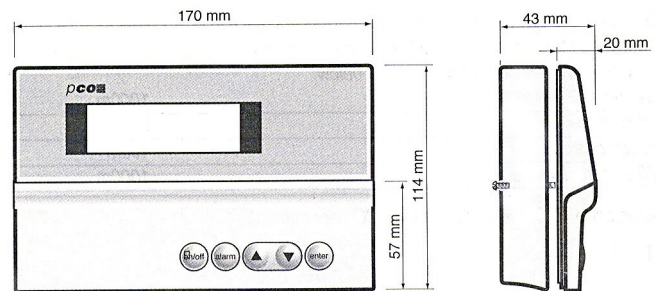


Fig. 12.1: Dimensions of remote control station

### 12.2 Remote Diagnosis System (RDS)

The **Remote Diagnosis System** allows direct access to the heat pump controller from a PC to evaluate and modify system data.

The **Remote Diagnosis System (RDS)** was developed to enable access to the heat pump manager via PC. The software – in conjunction with a PC with Internet capability and hardware packages to be bought separately – enables to read out and modify preset user settings. The software is programmed so that a permanent data exchange between the heat pump controller and the PC takes place. Changes are possible both at the controller and in the program. The software starts via an Internet browser available on the PC and was optimised for the operating systems Windows 2000, XP.

Two variants are available:

- On-site remote diagnosis (e.g. via laptop):  
**Local Diagnosis System (LDS)**

Direct cable connection of a PC to the Heat Pump Manager (WPM) (controller) via the LDS hardware package.

- Remote diagnosis via modem connection:  
**Remote Diagnosis System (RDS)**

Remote diagnosis of heat pumps via a modem connection. The RDS is a useful tool to check the operation of a remotely located system and to make user settings at the Heat Pump Manager (controller).

### 12.3 Room climate control station

Cooling by means of surface heating/cooling systems is controlled by the room temperature measured at the room climate control station.

The desired room temperature is set at the heat pump controller. The control behaviour of the cooling system is influenced by the currently sensed room temperature and the preset set-point temperature; if there is a danger of condensation forming, the cooling operation will be interrupted.



Fig. 12.2: Room climate control station

For warranty conditions and the customer service address, refer to the Installation and Operating Manual of the heat pump.  
Subject to modifications and errors!







All claims for damages are excluded. If this is legally not possible, these claims are limited to gross negligence and intent.

1. The 4-core **supply cable** for the **power circuit of the heat pump** is to be run from the heat pump meter to the utility company contactor (if required) into the heat pump (3L/PE~400V,50Hz).  
Fuse protection to be provided in accordance with power consumption values indicated on the data plate by means of a 3-pole circuit-breaker with C-characteristic and simultaneous tripping of all 3 poles.  
Cable cross-sectional area in accordance with DIN VDE 0100
2. The 3-core **supply cable** for the **heat pump controller (manager)** (heating controller N1) is to be fed into the heat pump (units with integrated controller) or routed to the subsequent mounting site of the wall-mounted heat pump controller (manager) (WPM).  
The supply line (L/N/PE~230V, 50Hz) for the WPM must be connected to continuous voltage and is therefore to be picked off ahead of the utility company disable contactor or to be connected to the wiring system of the building as otherwise important protective functions would be deactivated during the utility company off-times.
3. The rating of the **field supplied utility company disable contactor** (K22) with 3 main contacts (1/3/5 // 2/4/6) and one auxiliary contact (NO contact 13/14) depends on the heat pump capacity.  
The normally open contact of the utility company disable contactor (13/14) is to be looped through from terminal strip X2 to clamp-type terminal J5/ID3. **CAUTION!! Extra-low voltage**
4. In the case of single energy (mono-energetic) systems (suppl. heat source), the rating of the **field supplied contactor** (K20) for the **electric heating element** (E10) depends on the capacity of the heating element. Control (230VAC) is effected by the heat pump controller (manager) via terminals X1/N and J13/NO 4.
5. The rating of the **field supplied contactor** (K21) for the **immersion heater** (E9) inside the hot water depends on the immersion heater capacity. Control (230VAC) is effected from the heat pump controller (manager) via terminals X1/N and J16/NO 10.
6. The contactors described above under items 3;4;5 are built into the power distribution panel. The 5-conductor load lines (3L/N/PE 400V~50Hz) for the heating elements are to be sized and fuse-protected in accordance with DIN VDE 0100.
7. The **circulating pump for the heating system** (M13) is connected to terminals X1/N and **J13/NO 5**.
8. The **hot water circulating pump** (M18) is connected to terminals X1/N and **J13/NO 6**.
9. The brine and well pump is connected to terminals X1/N and **J12/NO 3**.  
In the case of air-to-water heat pumps **do not** connect a **heating system circulating pump** to this output!
10. In brine-to-water and water-to-water heat pumps with a **single** compressor, the **return sensor** (R2) is already connected.  
In air-to-water heat pumps for indoor installation, the return sensor is integrated and to be connected to the heat pump manager via two individual conductors in the control wire. The two individual conductors are connected to terminals X3 (Ground) and **J2/B2**.  
In air-to-water heat pumps for outdoor installation, the return sensor must be fitted to the common return pipe for space heating and hot water (e.g. immersion well in compact manifold).  
The connection at the heat pump controller (manager) is also to be made at the following terminals: X3 (Ground) and J2/B2.
11. The **external sensor** (R1) is to be connected to terminals X3 (Ground) and **J2/B1**.
12. The **hot water sensor** (R3) is built into the hot water tank and to be connected to terminals X3 (Ground) and **J2/B3**.
13. The connection between heat pump (round connector) and heat pump controller (manager) is effected by means of polarized **control wires**, which need to be ordered separately for heat pumps installed outdoors.

**Sensor lines may be extended to up to 30 m using 2x0.75mm<sup>2</sup> wires.**

# 14 Quick Reference Guide for the User

## 1. Selection of the operating mode via the Modus button (see 3.1.2)

Cooling		The unit operates in the cooling mode.
Summer		Only domestic water heating and swimming pool heating takes place. Frost protection is ensured.
Automatic		Programmed operating times are automatically activated.
Holiday		Temperature setback and a water heating lock-out function are activated for a preset period of days.
Party		Any programmed lowering of the heating curves will be ignored.
Suppl. heat source		HP operation is disabled. Heat will be generated by the supplementary heat source.

## 2. Changing preset values:

- Keep the MENUE key depressed for a few seconds
- Select the desired menu item using the arrow keys (↑ and ↓)
- Confirm by pressing the ENTER key (↵)
- Select the desired submenu item using the arrow keys (↑ and ↓)
- Confirm by pressing the ENTER key (↵) until the cursor jumps to the preset value
- Modify the preset value to the desired value using the arrow keys (↑ and ↓)
- Confirm changed value by pressing the ENTER key (↵), or discard the change by pressing the ESC key

## 3. Settings menu (see 3.1.4)

Setting of all system-specific parameters.

- Time To set the time of day. No automatic changeover from daylight saving to winter time
- Mode Different settings concerning the operating modes (cf. 2.)
- Heating circuit 1 Settings for heating circuit 1
- Heating circuit 2 Settings for heating circuit 2
- Heating circuit 3 Settings for heating circuit 3
- Cooling Settings for the cooling mode
- Hot water Settings for domestic water heating
- Date To set the date. Only required in leap years.

## 4. Operating data menu (see 3.1.5)

Display of the sensor characteristics.

## 5. History menu (see 3.1.6)

Display of running times and of stored data (e.g. malfunctions).

## 6. Heating curves (see 3.1.7)

The heating curve can be adjusted to individual temperature requirements by means of the warmer/colder control on the main screen. Use key ↑ / ↓ to raise/lower the temperature. The setting for heating circuit 2/3 can be performed in the "Heating circuit 2 / Heating circuit 3" menu. Where an overlap of raising and lowering actions occurs, the raising action takes precedence.

## 7. Hot water heating (see 3.1.8)

In the "Settings – Hot water" menu option, it is possible to program – apart from the hot water temperature – also off-times for water heating in order to be able, for example, to set water heating to occur at night. In addition, there is a possibility of time-controlled reheating of the hot water to temperatures above 60° C.

## 8. Displays (see 3.2)

- Current operating state of the heat pump system
- Fault messages: (ESC key is flashing)
  - HP fault Indication of a defect in the HP. Contact the after-sales service.
  - System fault Indication of a defect or a maladjustment in the heat pump system. Contact your local installer.
  - Short-circ. or break A broken sensor or a sensor short-circuit may have occurred. Contact your local installer.